THE IRON AGE

Seventy-sixth Year

January 1, 1931

West Virginia Geological Survey
Morgantown, W. Va.

A Challenge to Sober Judgment

THE coming year will be a challenge to sound thinking and sober judgment. The wide swing from the zenith of prosperity in 1929 to the nadir of depression in 1930 brought an equally marked change in popular emotions. Extravagant antepanic praise of the "new era" has been replaced by exaggerated criticism of our economic system and a rising tide of proposals for social legislation.

The high sense of social responsibility that caused industry to maintain wage scales, rotate jobs, carry on improvement programs and give aid to the unavoidably idle augurs well for more constructive action with the passing of the present emergency. Manufacturers, no less than their workmen, want protection against the devastating effects of cyclical unemployment, but they will insist on sound measures, based on the solid foundation of our own traditions and our own experience.

Meanwhile their main concern is when and how business can be started on the road to recovery. In finances, processes and organization our basic industries are for the most part well prepared to keep pace with consumer demand however rapidly it may expand. In merchandising they are assuming the aggressive, realizing that much of the apparent loss of buying power is really a loss of inclination to buy. Latent demand will be brought out by more intensive cultivation of old markets and greater efforts to develop new ones. Large new reservoirs of wants will be opened up by technical and market research, which give glimpses of future developments that intrigue the imagination.

Renewed growth of industry is assured, but it must be healthy, nurtured in the soil of steady employment, steady prices and steady profits rather than in flush prosperity with its inevitable retribution. Such growth, moreover, must be kept free from the blight of collectivist ideas. It will flourish best under the vitalizing and energizing stimulus of voluntary cooperation, springing from the free play of individual initiative and enterprise.

THE IRON AGE

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Making it easy to concentrate purchases and save time, trouble and money

Ten thousand sizes and kinds of steel products—ready to ship

Shorten the work of buying your steel and allied products. Make one contact, one order, one checking, one invoice cover current requirements on the various lines. You'll find it saves time and trouble as well as money.

Note the diversity of steel lines shown here. The Ryerson Journal and Stock List will give you complete information including sizes, weights, etc. Make it your guide on steel. Write for the current issue.



Beams and Heavy Structurals

An unusually large stock of the heavier structural sections including special wide flange structural shapes.



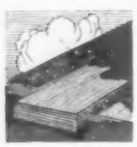
Channels, Angles, Tees and Zees

A complete range of both structural and bar sizes in all standard sections, also galvanized angles, ship and car channels, etc.



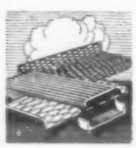
Rails, Splices, Spikes, Bolts, Etc.

Standard new rails with all accessories—splices, spikes, track bolts, etc.—are in stock for immediate shipment.



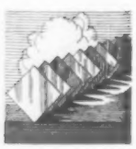
Plates

Steel plates U.M. and sheared, high carbon plates, Firebox steel, copper bearing, Armco Ingot Iron and diamond floor plates stocked.



Stair Stringers, Safety Tread, Etc.

Several types of safety tread for all stairways, inclined passageways, thresholds, etc. Also light weight steel stair stringers.



Sheets

Stocks include sheets for every purpose—more than twenty-five different kinds from plain black to Allegheny stainless, carried in a full range of sizes.



Hoops and Bands

Bands, both plain and galvanized, and hoops in both coils and straight lengths are carried in stock in a full range of sizes. Immediate shipment assured.



Bars—All Shapes and Sizes

Rounds, squares, flats, hexagons, ovals, half-ovals, half-rounds, bevel edge flats, etc., in a full range of sizes and lengths.



Cold Finished Steel Bars

Flats, rounds, squares and hexagons in various analyses. Triple inspected for accuracy, straightness and finish.



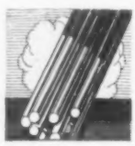
Extra Wide Cold Finished Flats

Cold finished flats in widths up to 12 inches and from ¼" to 2" thicknesses are carried in stock for immediate shipment.



Strip Steel, Flat Wire, Etc.

Stocks include cold rolled strip in dead soft, half hard and hard qualities, also cold rolled flat wire in coils or cut lengths.



S.A.E. Alloy Steels

Stocks include Hot Rolled S.A.E. 2315, 2320, 2330, 2335, 2340, 2345, 2350, 3115, 3120, 3135, 3140 and also Cold Drawn S.A.E. alloys of many analyses.



Allegheny Metal

—The unstaining, unrusting, untarnishing nickel chrome alloy that is being adopted for many purposes in all lines of industry. Large and complete stocks.



Heat Treated Alloy Steel Bars

Various grades of alloy steel bars heat treated and ready for use, in a wide range of sizes, including Nikrome, Ryco, etc.



Tool Steels

Special grades of tool steel for every shop requirement are carried in stock. Also tool steel sheets, tool holder bits, etc.



Chain, Grab Hooks, Etc.

Standard grades and sizes of chain, special chain for cranes and steam shovels, grab hooks and similar products can be shipped at once.



Boiler Tubes and Fittings

Boiler tubes, ferrules, flanges, hangers, lugs, crabs, hand holes, braces, nozzles, patch bolts and other allied products are in stock.



Welding Rod and Equipment

Special rods adapted to welding the various materials and also equipment for both acetylene and electric arc welding.



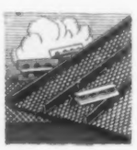
Rivets, Bolts, Nuts, Washers, Etc.

The range of kinds and sizes carried are too numerous to list. Stocks include practically all types of these and similar products.



Reinforcing Bars and Accessories

Concrete reinforcing bars are cut, bent and delivered as needed, including all accessories, carrion rings, etc.



Steel Building Products

Metal lath, steel stucco base, corner bead, picture mold, base screed, etc., round out our service to the contractor and builder.



Babbitt Metal and Solder

Five grades of Glyco Babbitt meet all bearing metal requirements. "Ryerson Guaranteed" solder is also stocked.



Machinery and Tools

Ryerson Machinery Division can meet all your requirements for machine tools, metal working equipment and small tools. Write for descriptive literature.

JOSEPH T. RYERSON & SON, INC.

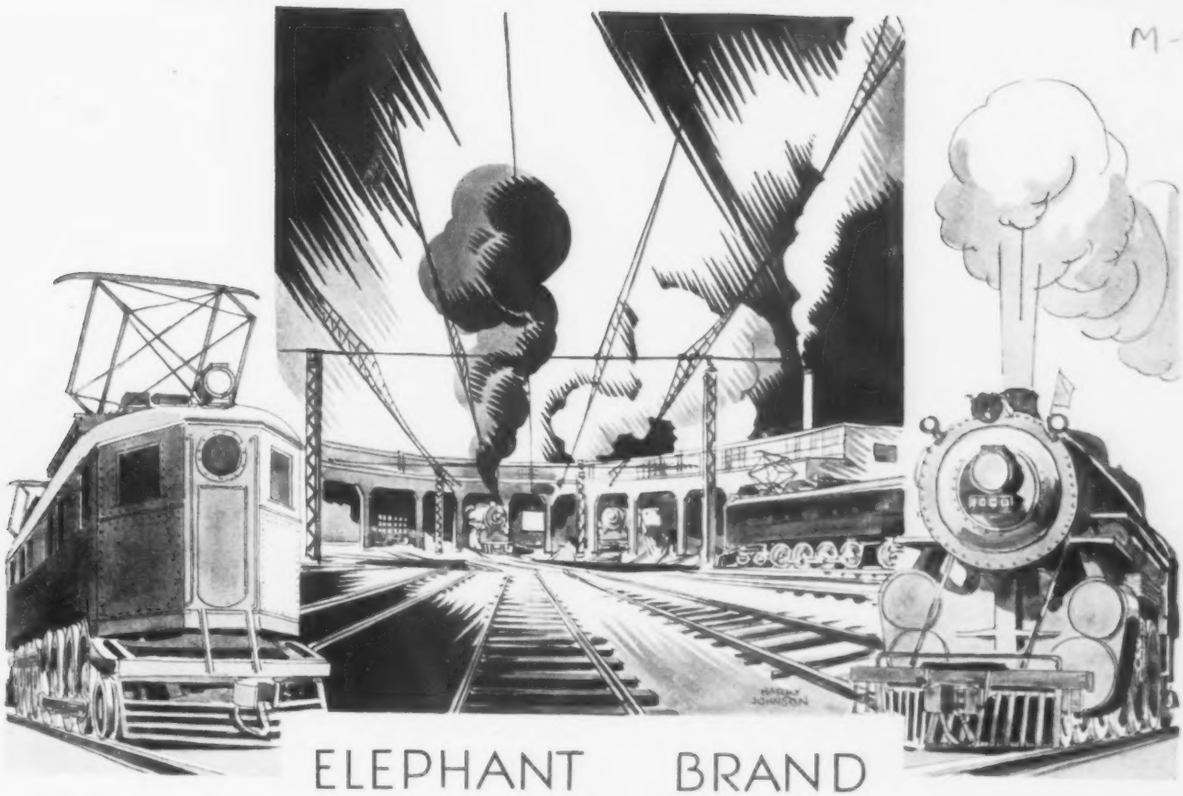
Plants: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

Representation in: Minneapolis, Tulsa, Rockford, Kansas City, Houston, Dallas, Newark, New York, Denver, Los Angeles, San Francisco

RYERSON
STEEL-SERVICE

THE IRON AGE, published weekly by the *IRON AGE PUBLISHING CO.*, at 239 W. 39th St., New York, N. Y., U. S. A. Entered as second class matter, June 18, 1879, at the Post Office at New York under the Act of March 3, 1879. $6.00 a year in U. S.; Canada $8.50; Foreign $12.00. January 1, 1931. Vol. 127, No. 1.

M-22



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PHOSPHOR BRONZE

in Modern Industries

---The Railroad

For many years the railroads have been using large quantities of Elephant Brand Phosphor Bronze for journal bearing and other purposes. Its hardness, durability and anti-friction qualities minimize wear on journals and reduce heating tendencies—insuring longer service under the most severe conditions.

With the electrification of the railroad, Elephant Brand Phosphor Bronze met their strict specifications for other requirements and is now used in many parts such as clips, bolts, nuts, clamps, strut rods, etc., also used in their signal and lighting systems.

Elephant Brand Phosphor Bronze has been applied in many other industries in innumerable ways with excellent results. It possesses the desired qualities of toughness and great tensile strength, in addition to its corrosion and crystallization resisting qualities. This combination produces a superior metal for all exposed work and heavy work. Its great elasticity makes it greatly desirable as a spring metal. There is a grade for every purpose.

Our booklet containing complete information and prices mailed on request.

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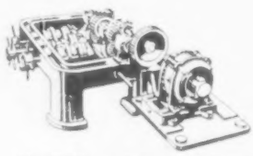
Ingots—Castings—Rods—Wire—Sheets—Ropes—Tubing

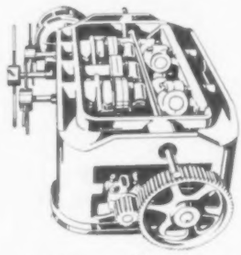
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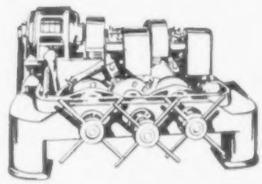
SUTTON ENGINEERING COMPANY.

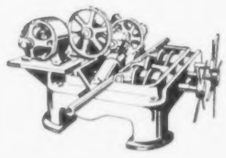
Park Bldg. Pittsburgh

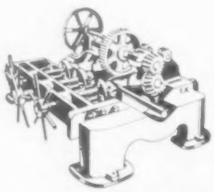
STRAIGHTENING MACHINERY


No. 0 Round Straightener

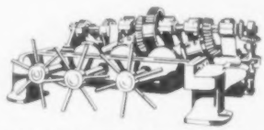

No. 1 Round Straightener

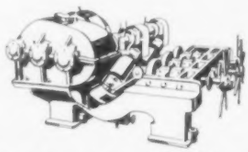

No. 1 Special Round Straightener

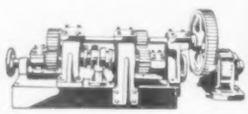

No. 2 Round Straightener

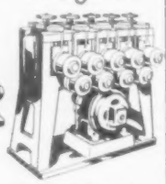

No. 3 Round Straightener


No. 3 A Round Straightener


No. 4 Round Straightener

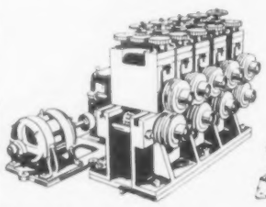

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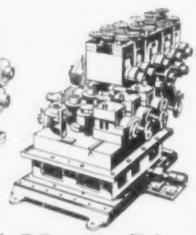

No. 00 Disc Type Straightener

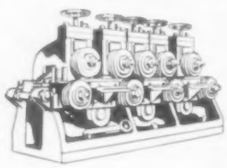

No. 2 Flat and Shape Straightener

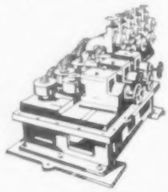
We Manufacture

Straightening Machines
for
Bars 1/8" to 8"
Tubes 1/8" to 26" OD
All Shapes and Sheets
Ferrous and Non-Ferrous
Materials
Hot Rolled and
Bright Finish

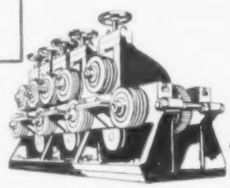

No. 3 Special Flat and Shape Straightener

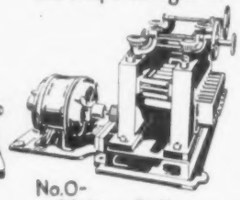

No. 3 Two-Way Flat and Shape Straightener


No. 4 Flat and Shape Straightener

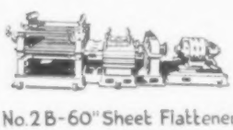

No. 4 Two-Way Flat and Shape Straightener


No. 4 Special Two-Way Flat and Shape Straightener


No. 5 Flat and Shape Straightener

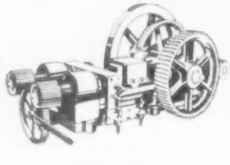

No. 0-10" Sheet Flattener

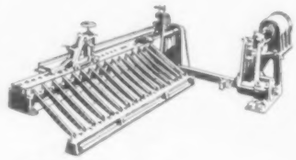

No. 2-60" Direct Drive Sheet Flattener

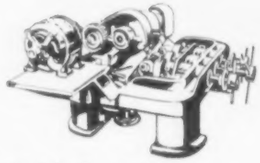

No. 2 B-60" Sheet Flattener


Double Head Straightener

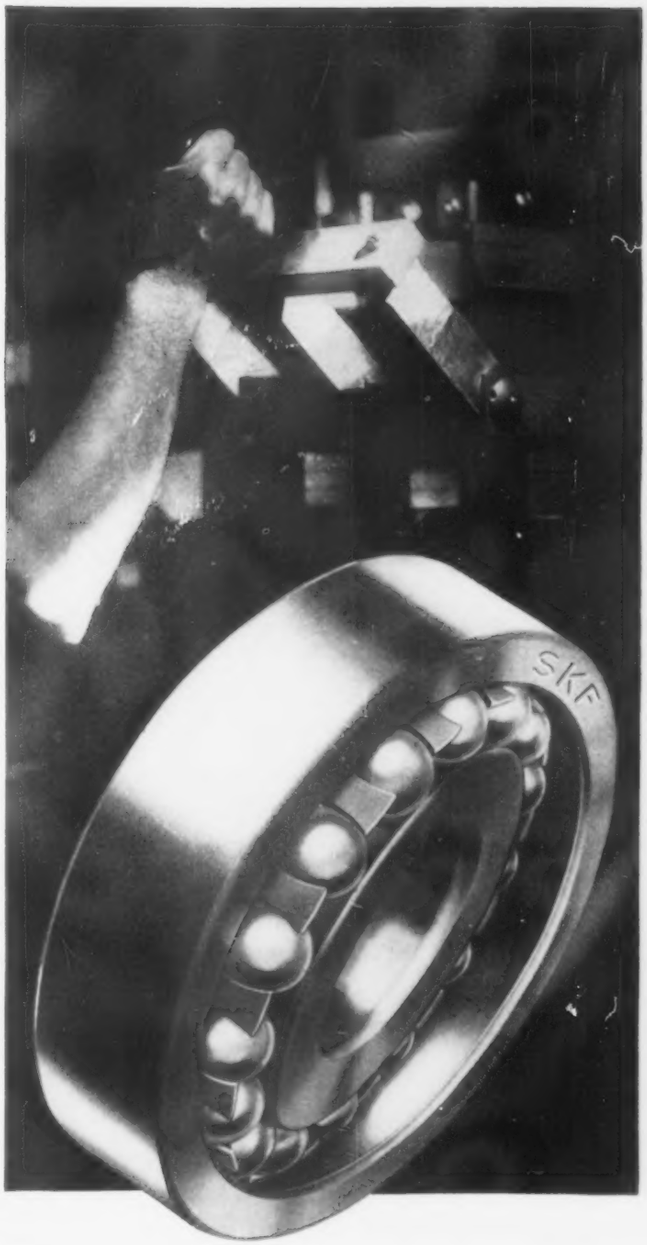

No. 1 Single Head Straightener


No. 2 Single Head Straightener


Stretcher and Cooling Table


No. 1 A-Special Straightening Machine


No. 1 Special Drive Fast Round Straightener



A PROMISE
is Only a Promise....
PERFORMANCE
is History!

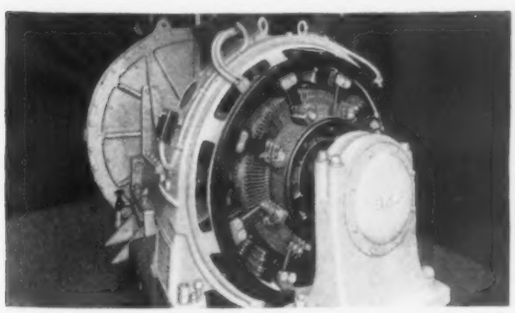
And Performance is the Basis Upon Which Eighty-three Representative Manufacturers of Rotating Electrical Equipment are Selecting SKF Ball and Roller Bearings.

Performance... that's it... performance... in a bearing it's the ONLY thing that counts.

On what other basis should a bearing be manufactured... or sold... or bought? On what other basis should a bearing be judged?

And so, SKF maintains its own mines from which to get the ores for its special steels... its own forests from which to get the charcoal for processing these steels... its laboratories at home and abroad... its numerous plants everywhere... all with the idea of building performance... and still more performance... into SKF Bearings.

Performance... dependable year in and year out performance... is the quality that has made SKF the selected bearing of practically every industry in the country... and more specifically, the selected bearing of 83 manufacturers of rotating electrical equipment. SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.



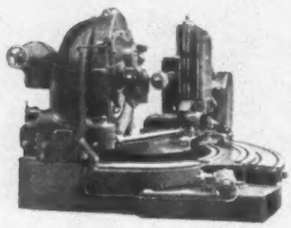
Nothing but Performance could have caused the General Electric Company to use SKF Bearings on this electric motor. It drives a great pump, also SKF-equipped, on the U. S. Engineers Department dredge, "Willets Point."

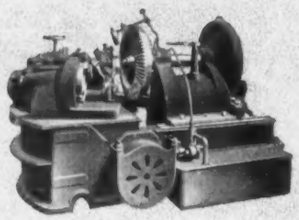
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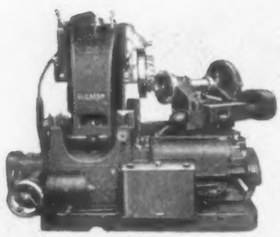
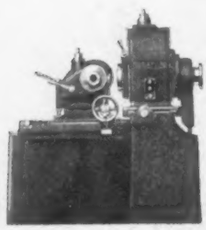
GLEASON BEVEL G

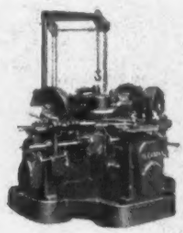
GENERATORS are built for cutting Spiral Bevel Gears from the smallest sizes up to 90″ pitch diameter. Those for cutting gears up to about 30″ employ a circular cutter of the face mill type. The gear blank and rotating cutter are rolled together to correctly generate the tooth profile. Spiral Bevel Gears over 30″ are correctly generated in a similar manner on machines which operate with a single tool. These machines are especially convenient for cutting single pairs and small lots.

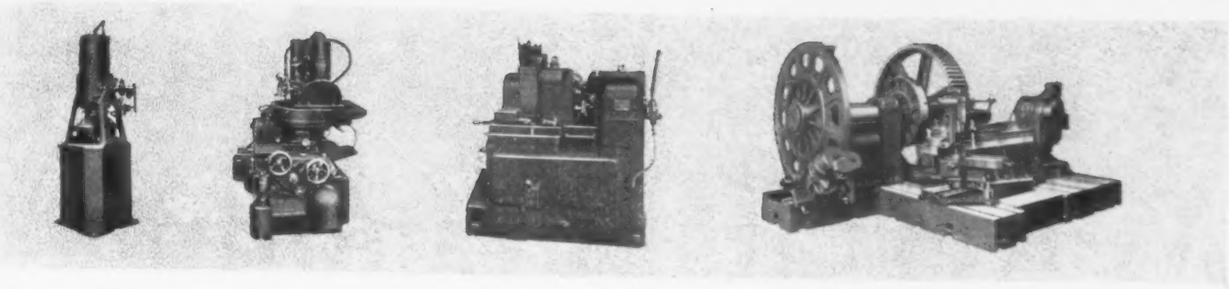
Straight Bevel Gear Generators are built for cutting Straight Bevel Gears up to about 30″ pitch diameter. They employ two tools and correctly generate the tooth profile by rolling the gear blank with the reciprocating tools. These machines are fully universal, quickly set up and are complete units for both roughing and finishing.

Straight Bevel Gears over 30″ are generally cut with a single tool on Bevel Gear Planers which copy the tooth shape from a former. The larger planers cut both Spur and Bevel Gears.

The Gleason Works also builds auxilliary equipment which includes Testing, Lapping and Burnishing Machines, Quenching Presses and Cutter Sharpeners for tools and cutters used on the cutting machines. A complete line of high production machines is also built.





L GEAR MACHINES

SEVERAL new machines which have been developed by the Gleason Works are received in this issue. They have been designed and built to meet the constant demand for improved methods and higher quality.

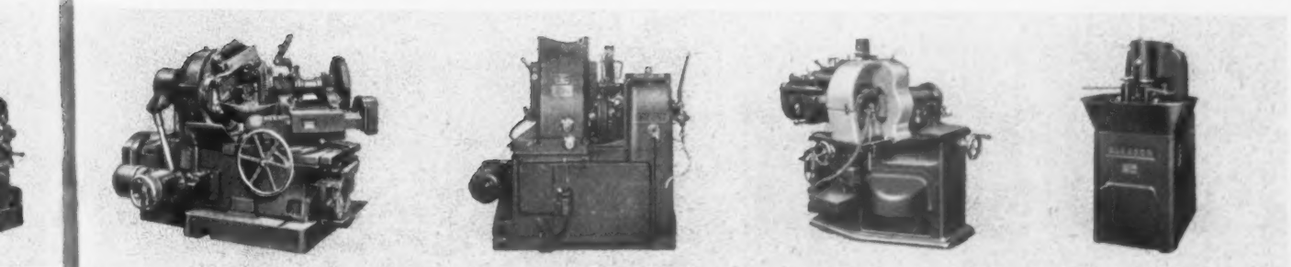
These new machines are built with the latest improvements incorporated into their design. They fill a definite need in the production of Bevel Gears. Some of them or perhaps others illustrated on this page will be an asset to your gear cutting department.

Send today for complete details of the complete line of Gleason Bevel Gear Machinery. If blueprints of gears accompanying the request, complete details regarding production and chucking equipment will be furnished.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Sixty Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

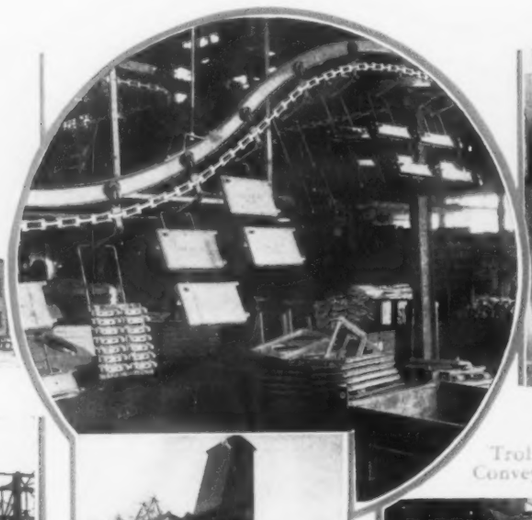


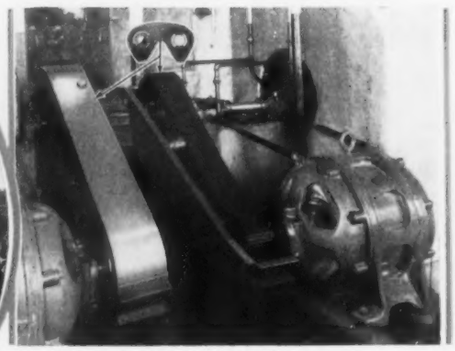
ANNUAL REVIEW NUMBER OF
THE IRON AGE — January 1, 1931
PAGE 8

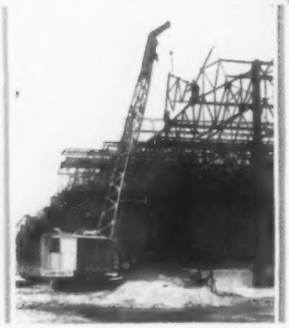
LINK-BELT

Materials Handling *and* Positive Power


Bucket Elevator


Trolley Conveyor

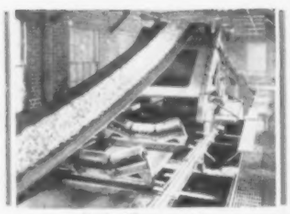

Silent Chain Drive


Crawler Crane

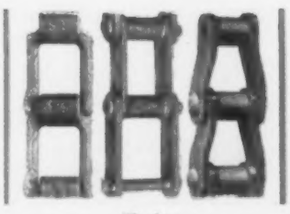

Skip Hoist

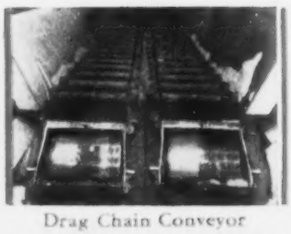

Vibrating Screen


Locomotive Crane


Belt Conveyor


Quenching Conveyor

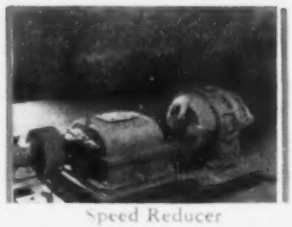

Chains


Drag Chain Conveyor


Peck Carrier

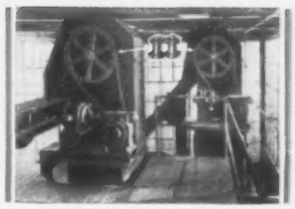

Water Intake Screen


Screw Conveyor


Speed Reducer


P. I. V. Gear


Foundry Conveyor


Elevator Head Drives


Transmission Accessories

Transmitting Equipment

Increase Net Profits Now!

Now is the time to adopt up-to-date efficient equipment in order to manufacture so economically that net profits will increase.

It isn't always necessary to install entirely new conveying or power transmitting systems to achieve this result. Frequently present equipment can be modernized by a comparatively small expenditure.

Link-Belt offers a comprehensive service to industry in bettering present methods of handling, and supplying positive methods of transmitting power. Our advice and service based on long experience is at your disposal for new installations or the revamping and repair of present-running equipment.

Send for General Catalog No. 500, and tell us about your problem.

LINK-BELT COMPANY 4165

Leading Manufacturers of Equipment for Handling Materials Mechanically and for the Positive Transmission of Power

CHICAGO INDIANAPOLIS PHILADELPHIA
SAN FRANCISCO TORONTO

Offices in Principal Cities


Car Spotter


Portable Belt Conveyor


Roller Chain Drive


Heavy Duty Ore Feeder


Bridge Tramway


Car Dumper


Assembly Conveyor

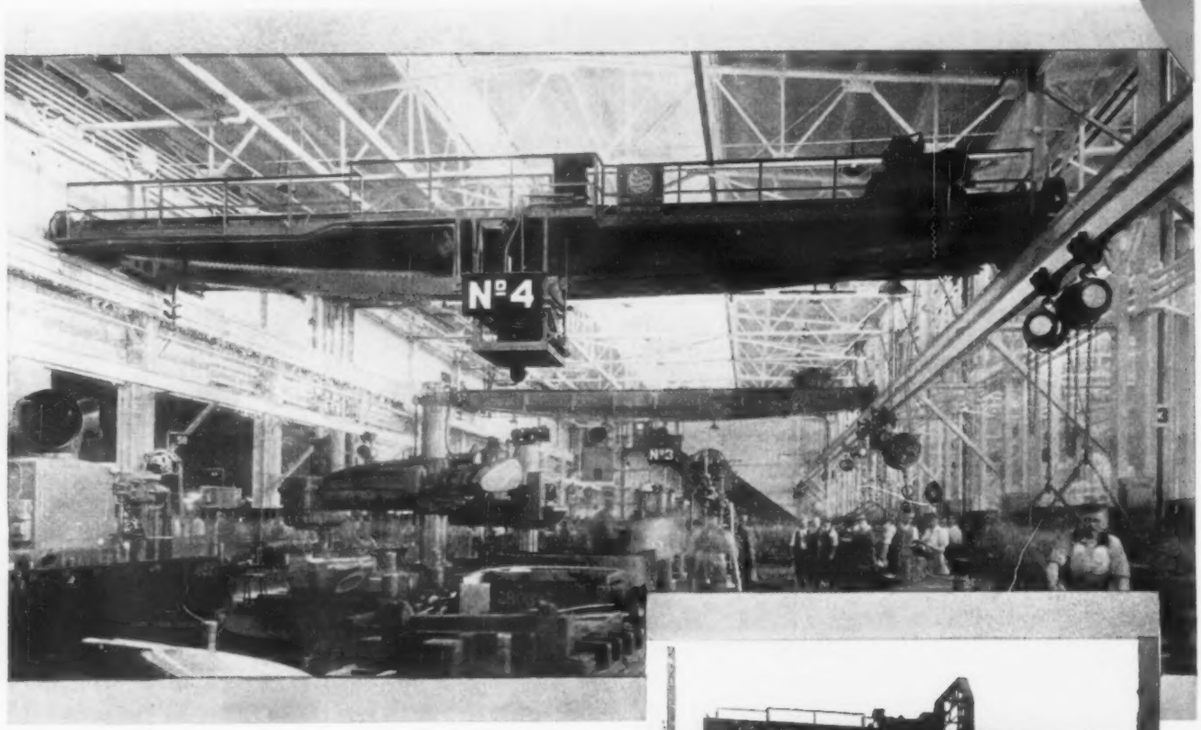

Crawler Loader


Jak-Tung Trucks

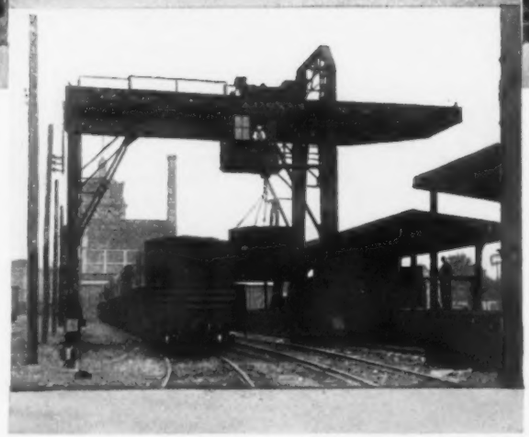

Wire Draw Bench Chain

LINK-BELT

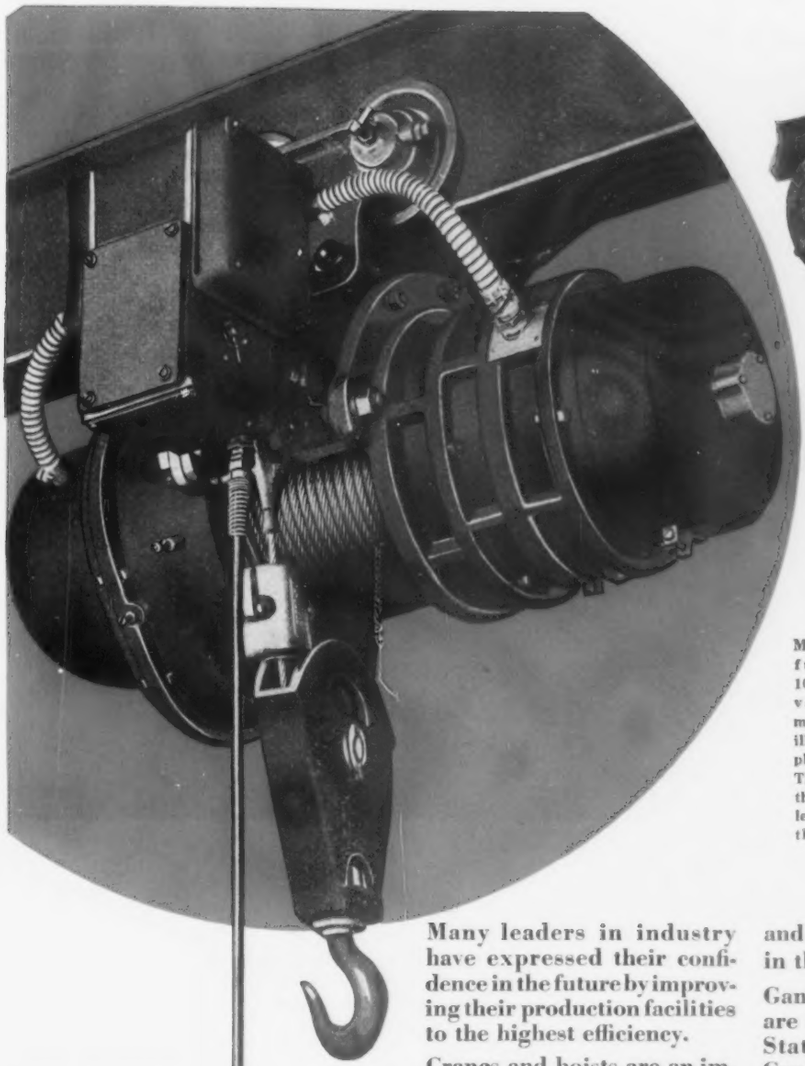
MILWAUKEE
ROLLER BEARING
CRANES AND HOISTS

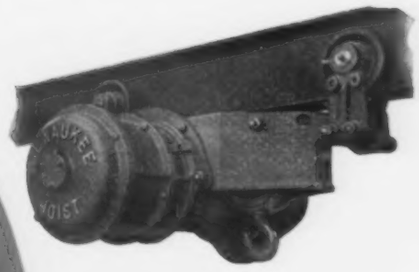


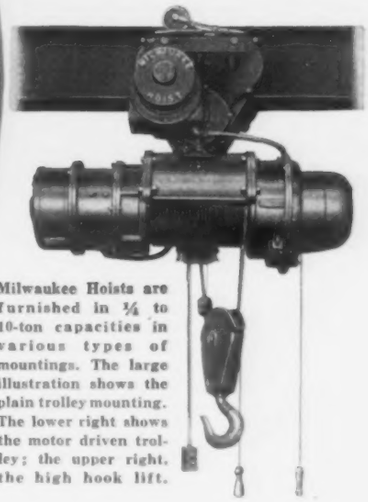
Two Milwaukee 15-Ton Roller Bearing Cranes in one of the largest automobile body plants. Milwaukee Cranes are designed and engineered for full roller bearing construction and represent the highest achievement in equipment of this kind.



The smaller illustration shows a 10-Ton Milwaukee Gantry handling freight containers in the yards of a large Eastern trunk line.







Milwaukee Hoists are furnished in ¼ to 10-ton capacities in various types of mountings. The large illustration shows the plain trolley mounting. The lower right shows the motor driven trolley; the upper right, the high hook lift.

MILWAUKEE HOIST FEATURES

- High Speeds
- Push Button or Rope Control
- Roller Bearings Throughout
- All Adjustments Made on Outside
- Double Drive Hoist Gearing
- All Loads Carried by Steel Members
- Forged Heat-Treated Gears and Pinions
- Forged Steel Trolley Wheels
- Ball Bearing Motors Especially Designed for Hoist Service
- Limit Switch of Weight Operated Type

●

Many leaders in industry have expressed their confidence in the future by improving their production facilities to the highest efficiency.

Cranes and hoists are an important part of every production plan . . . and Milwaukee offers a complete line for every need.

"Milwaukee" Standard Cranes are built in capacities up to 50 tons. They are equipped with roller bearings throughout. They give dependable performance at low maintenance and operating cost.

"Milwaukee" Standard Low Headroom Full Roller Bearing Cranes are available in 3 to 30 ton capacities. They require as little as 2 ft. 11½ in. headroom. These low clearances permit installations in existing buildings and make possible substantial savings in the construction of new buildings.

Gantry Cranes, made by "Milwaukee", are in service throughout the United States. "Milwaukee" placed more Gantries in service in 1930 than any other manufacturer.

"Milwaukee" Roller Bearing Hoists are made in ¼ to 10-ton capacities with a complete variety of mountings to meet every requirement.

"Milwaukee" Cranes and Hoists are the product of the world's largest staff of crane and hoist engineers. Their full roller bearing features assure low maintenance cost, quick acceleration and substantial savings in power.

Get full details from Milwaukee before you buy . . . and expect more in dollar for dollar value.

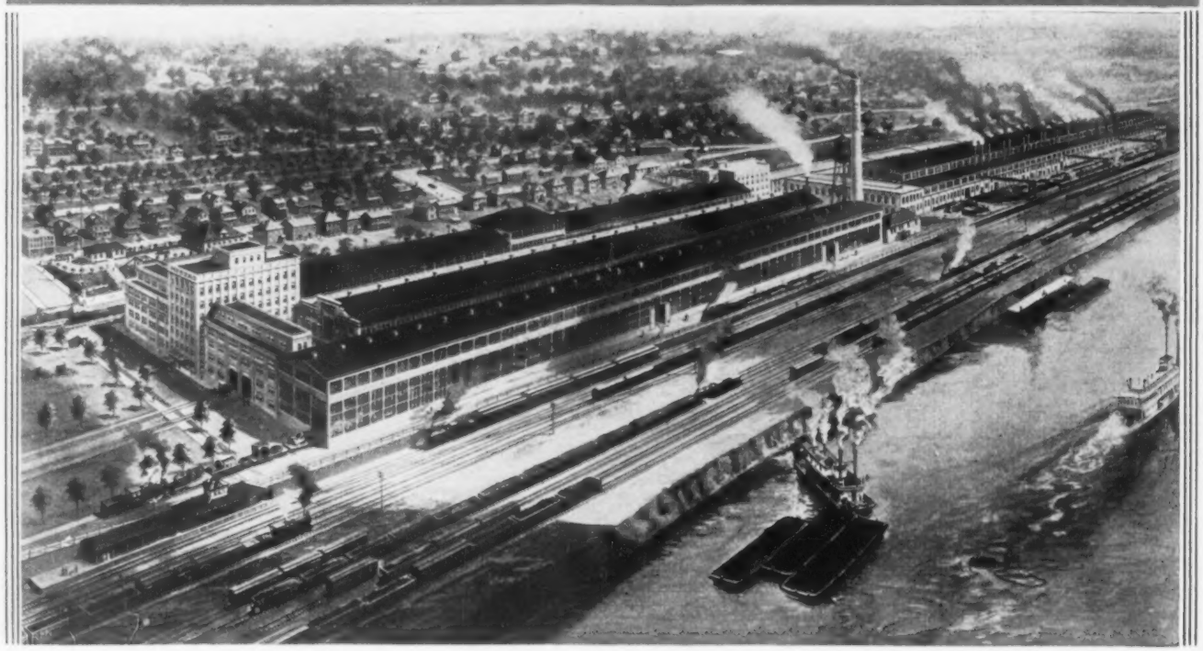
MILWAUKEE ELECTRIC CRANE & HOIST CORPORATION
Division of HARNISCHFEGER CORPORATION
MILWAUKEE, WISCONSIN

HOISTS MILWAUKEE CRANES ROLLER BEARING CRANES

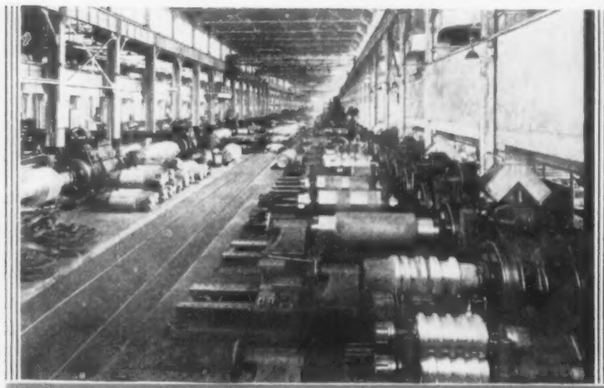
MILWAUKEE

LOW HEADROOM CRANES—3 TO 30 TONS
STANDARD CRANES TO 50 TONS

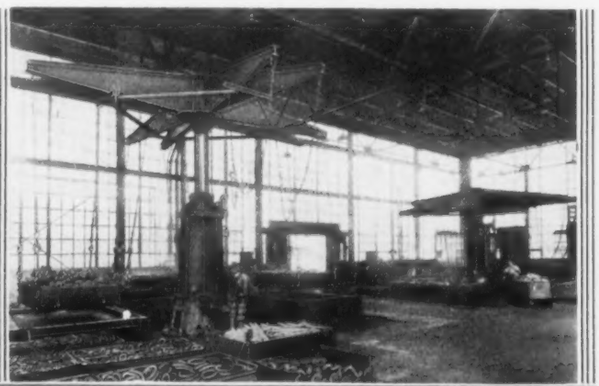
FROM RAW MATERIAL TO FINISHED



The Mesta Machine Company is the largest unit plant in the world devoted to the building of steel works equipment. The plant and general offices occupy a site of about 26 acres at West Homestead, Pa., just outside of Pittsburgh.



General View in MESTA Roll Finishing Department

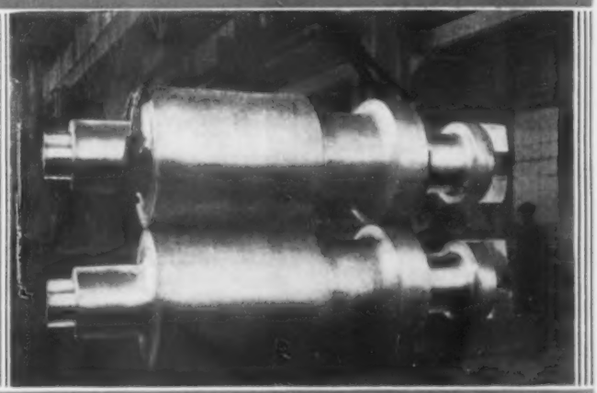


Installation of Two MESTA Patented Pickling Machines in Drop Forging Plant

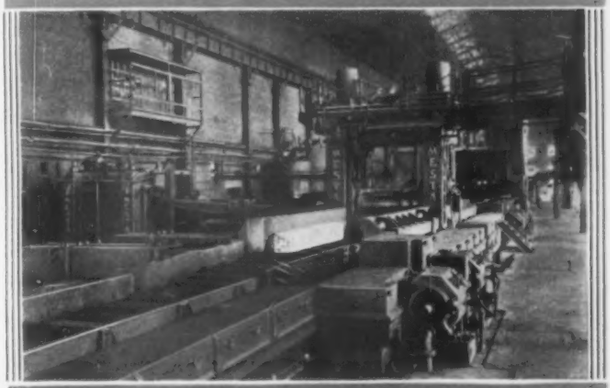
PRODUCT Mesta BUILT

MESTA equipment is built complete from the raw materials to the finished product entirely within the MESTA plant. Under this plan of production absolute control of materials, coupled with more thorough supervision by experts is assured. Unparalleled manufacturing facilities, rigid inspection and an efficient engineering organization are the principal factors responsible for the creation and building of equipment that maintains high production schedules with a minimum of upkeep expense.

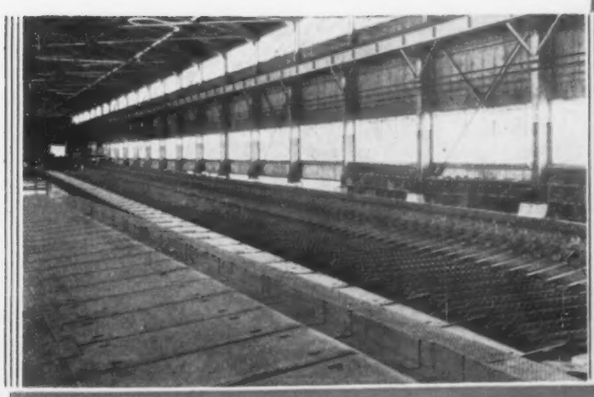
MESTA MACHINE COMPANY
PITTSBURGH, » » » PENNA.



World's Largest Blooming Mill Rolls 57" Diameter, 120" Body Length, 18' 3½" Total Length, Weight 105,000 lbs. each



40" Blooming Mill Installation



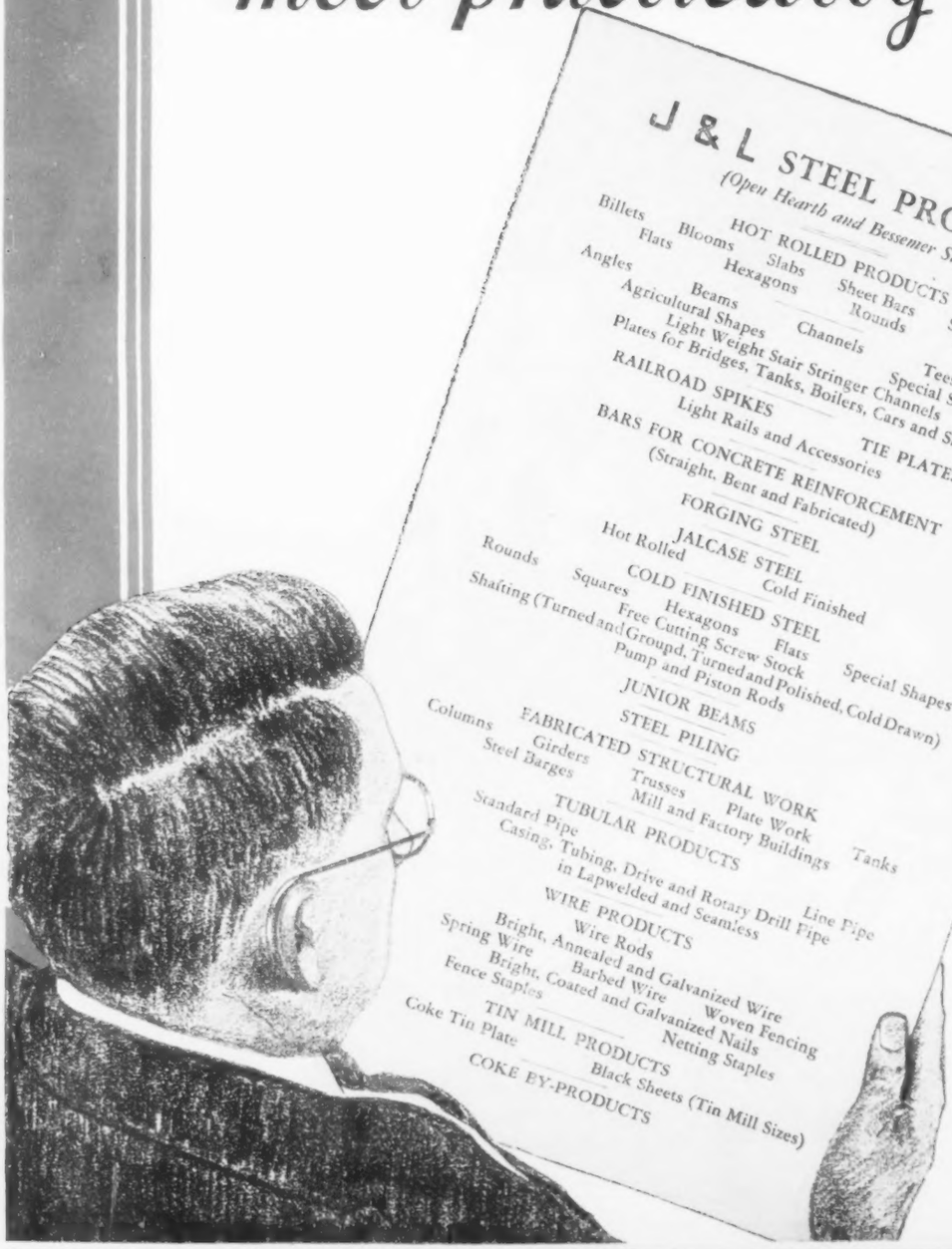
MESTA Pack Annealing Cooling Bed, Fisk Patent



4000 H. P. Gear Train for Driving Continuous Mills

J&L

meet practically every



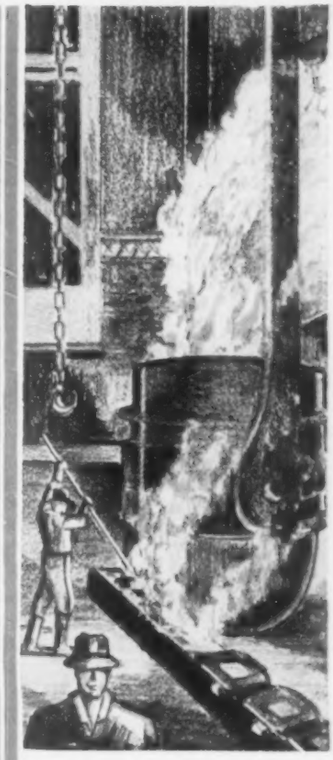
J&L STEEL

JONES & LAUGHLIN STEEL

AMERICAN IRON

J & L *Sales Offices:* Atlanta Boston Buffalo Chicago Cincinnati Cleveland Dallas
Detroit Denver Erie Los Angeles Memphis Milwaukee Minneapolis
New York Philadelphia Pittsburgh St. Louis San Francisco Washington

PRODUCTS REQUIREMENT *for* STEEL



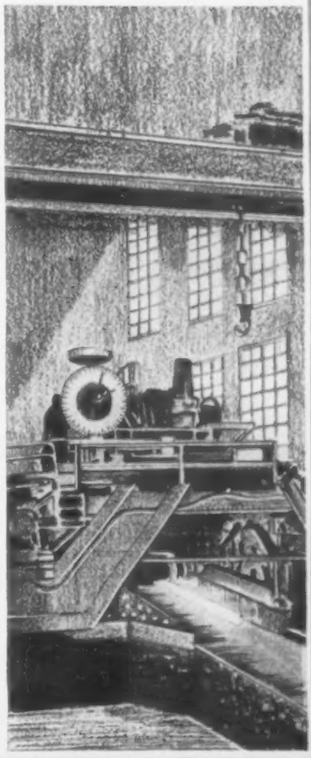
In placing orders for the principal steel products you use, consider the advantages of buying from a manufacturer who can also furnish the steel for your other needs.

The many companies which have adopted the practice of using J & L Steel for all requirements find that this efficient method of buying steel products saves them all the time, clerical labor and overhead expense that division of purchases among many makers entails upon their organizations.

By obtaining all your steel from J & L —a single, reliable source exercising ownership control over all its raw materials and processes of manufacture—you supply your operating departments with steel products of uniform quality.

When time is important, you can order from J & L Warehouses in Chicago, Cincinnati, Detroit and Pittsburgh, and receive immediate delivery of J & L Steel products of the same quality you are accustomed to receiving on mill orders.

Standardize on J & L Steel.



CORPORATION-PITTSBURGH

AND STEEL WORKS

J & L *Warehouses:* Chicago Cincinnati Detroit *Memphis Pittsburgh

** Distributing Warehouse for Pipe, Wire Products, Sheets, Spikes and Bars for Concrete Reinforcement*

Canadian Representatives: Jones & Laughlin Steel Corporation, Pittsburgh, Pa., U. S. A., and Toronto, Ont., Canada

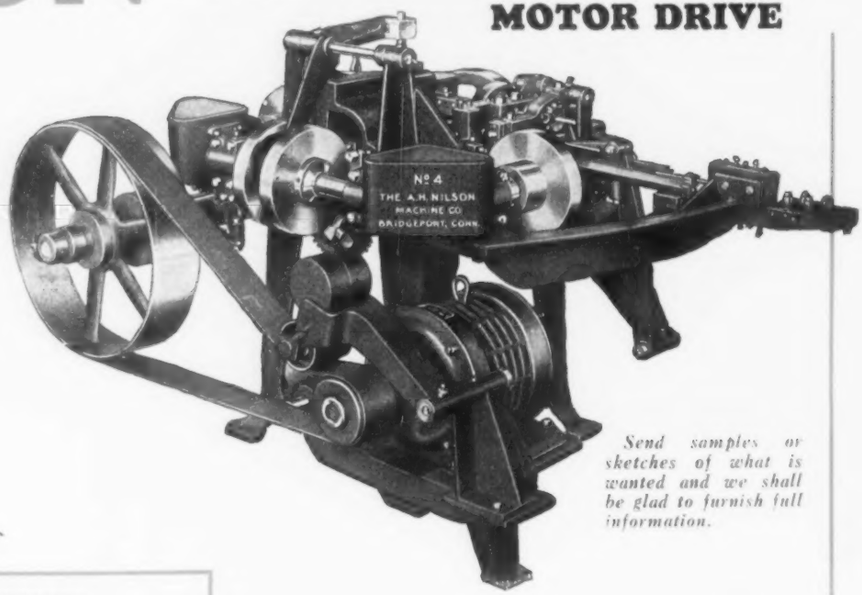
A H N MACHINE CO.

WIRE & METAL RIBBON

NILSON

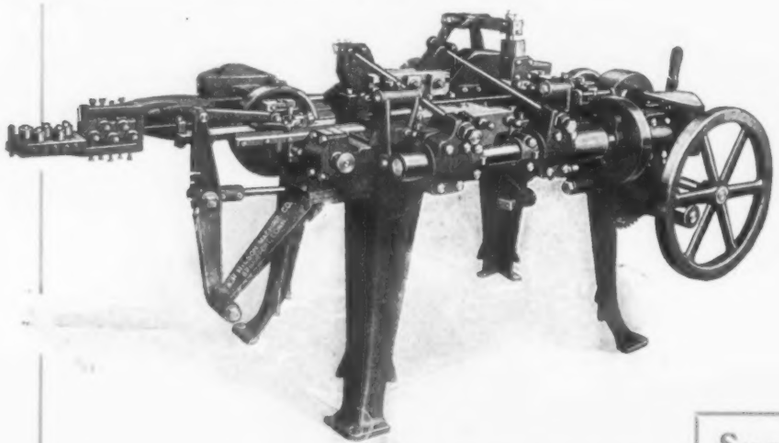
STANDARD FORM-SLIDE MACHINE WITH INDIVIDUAL MOTOR DRIVE

Equipped with motor drive, this machine can be operated anywhere regardless of line shafting. Its design makes it very compact, yet every part is readily accessible. The idler on the belt drive assures a positive grip on the drive pulley and reduces slippage to a minimum on varying load conditions. This machine is up to the minute in all its features and its flexibility and efficiency mean operating economies.



Send samples or sketches of what is wanted and we shall be glad to furnish full information.

COMBINATION POWER PRESS AND FOUR SLIDE FORMING MACHINE



This combination press and forming machine is built in three sizes to handle all types of products formed from wire or metal ribbon. It can be used to blank, pierce, and form, and readily combine and simplify operation that cannot be advantageously done on the ordinary punch press. Besides our regular machines we have designed and produced several hundred special automatic machines of high productive capacity.

Special Machines Designed

The A. H. NILSON MACHINE

FORMING MACHINERY



The Nilson Tilting Wire Reel in vertical position, loaded with coil of wire.

NILSON

Wire Reels

The Nilson Tilting Wire Reel is a labor and time saver that returns its purchase price in service within a very short time.

It enables one man to easily do what was formerly hard work for two.

The operator trips the lever with his foot, and the upper part of reel is gradually lowered until the wire carrying section is within a few inches of the floor. The guards are then removed from the prongs, and replaced after the coil of wire has been slid upon the carrier. Set screws are then tightened and all the operator has to do is return the loaded reel to its upright position by merely releasing the lever.

Write for our Wire Reel Catalog No. 51



The Nilson Tilting Wire Reel at an angle of 45 degrees, showing the action of counterbalancing weight.

The reel is accurately balanced so that it is under perfect control of operator at all times.

The Nilson Tilting Wire Reel is built in three sizes:

No. 51-A 200-lb. coil. Arms adjustable to 8 inches; diameter of ring 30 inches.

No. 51-B 300-lb. coil. Arms adjustable to 12 inches; diameter of ring 36 inches.

No. 51-K 325-lb. coil. Arms adjustable to 15 inches; diameter of ring 42 inches.

and Built to Order

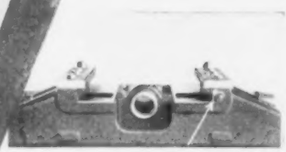
COMPANY, Bridgeport, Conn., U.S.A.

GIBS













EVERY flat bearing surface on Cincinnati Rapid Traverse Shapers has a gib. They are full length tapered gibs with a single screw adjustment.

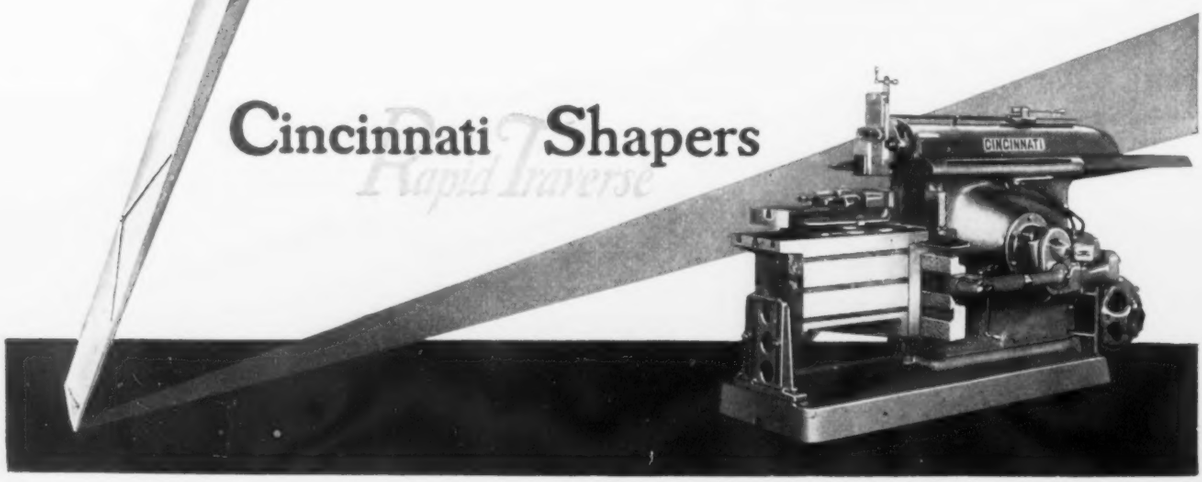
The Cincinnati sliding block is gibbed—an important and necessary feature. The ram bearing has a full length tapered gib which forces the ram bearings to wear straight—an equally important feature.

If you appreciate the value of single screw adjusting full length tapered gibs; if you appreciate the value of a uniform adjustment from a single point; and if you demand a take-up on every flat bearing surface—your next shaper purchases will be limited to Cincinnati Rapid Traverse Shapers.

THE CINCINNATI SHAPER CO.
CINCINNATI, OHIO

Cincinnati Shapers

Rapid Traverse



LANDIS

GROUND THREAD CHASERS



LANDIS
REG. U.S. TRADE MARK PAT. OFF.

ANNOUNCING –

The LANDIS GROUND THREAD CHASER—a super-precision threading tool—a product of Landis skill and experience which marks another step forward in threading efficiency and which makes a degree of thread accuracy, heretofore unobtainable, a reality.

In addition to their gauge-like precision, LANDIS GROUND THREAD CHASERS give the versatility and in an increased degree, the life and economy long since identified as inherent features of the Landis threading principle.

Give the new Landis chaser a trial. Convince yourself of the importance of this notable achievement.

LANDIS GROUND THREAD CHASERS are now available for all sizes of LANCO and LANDEX heads and for the 5/8", 7/8", 1 1/4" and 2" LANDMATIC heads.

LANDIS MACHINE COMPANY

WAYNESBORO PENNA., U. S. A.

MANUFACTURERS OF THREADING EQUIPMENT

Modern Machine Designers

Need No Longer Tolerate Grease and Oil Leaks

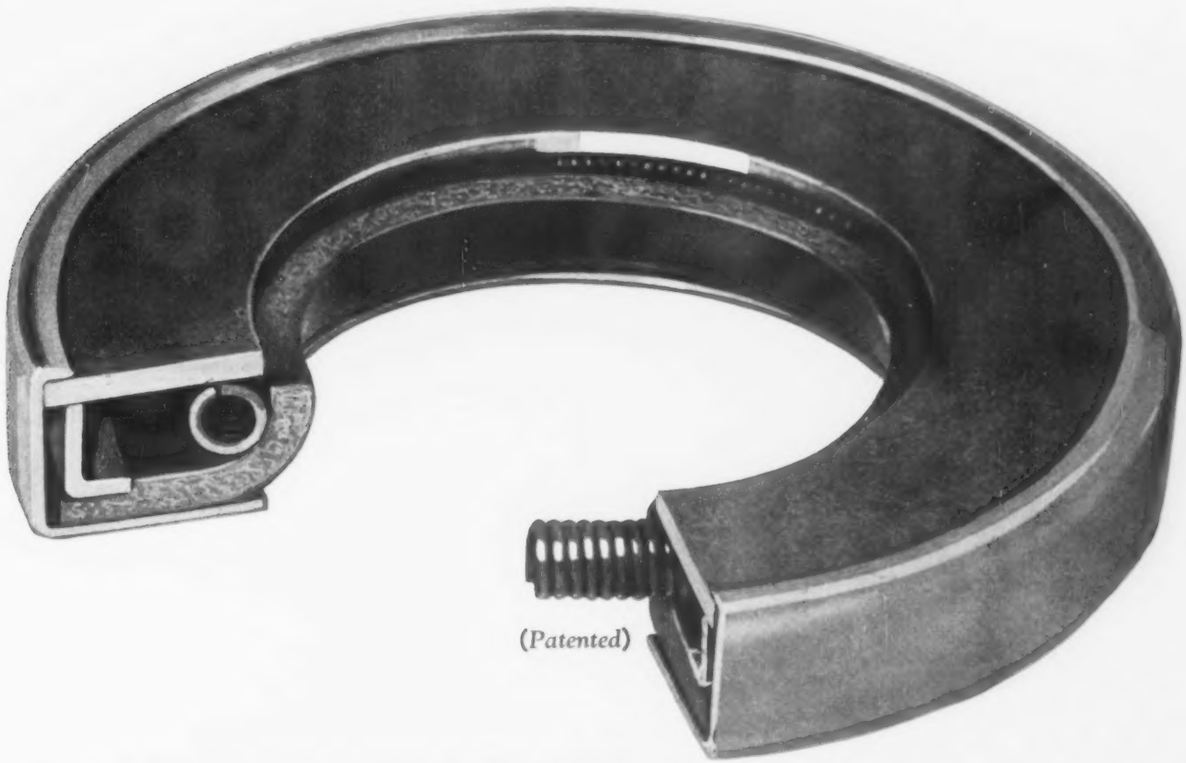
The Perfect Oil Retainer is the modern solution of a problem that has long confronted engineers and designers — the problem of preventing dangerous, disagreeable, wasteful lubricant leaks.

The scientific design of this seal is the result of years of concentration on the development of leather packing devices for the dual purpose of retaining lubricant and of excluding moisture, dust, metal particles and abrasive substances.

The Perfect Oil Retainer is economical because it is delivered as a simple, compact, self-contained unit with the specially tanned leather packing member, spring and pressed steel retainers properly assembled.

The Chicago Rawhide Manufacturing Company

1306 ELSTON AVENUE, CHICAGO, ILL. BRANCHES: New York, Detroit, Cleveland, Philadelphia



(*Patented*)

THE PERFECT OIL RETAINER

IF MADE OF LEATHER FOR MECHANICAL PURPOSES, WE MAKE IT

Ingersoll-Rand Products
for the
Iron and Steel Industry

Air Compressors

Capacities up to 25,000 cu. ft. per min. Practically any desired pressure or vacuum. Control and type of drive to suit the requirements of any installation.

Turbo-Blowers and Compressors

Capacities up to 100,000 cu. ft. per min., turbine or motor driven.

Portable Air Compressors

Available in capacities up to 500 cu. ft. per min. on various types of mountings.

Pneumatic Tools

A complete line of air driven tools—hoists, riveters, chippers, grinders, drills, sand rammers, etc.

Oil-Electric Locomotives

For railroad and industrial yard switching, and freight transfer service.

Cameron Pumps

Centrifugal and direct-acting pumps for all services.

Diesel-Engines

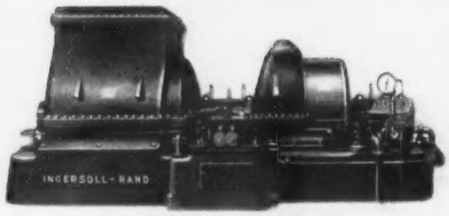
4-cycle, solid injection engines up to 1200 hp. per unit.

Condensing Equipment

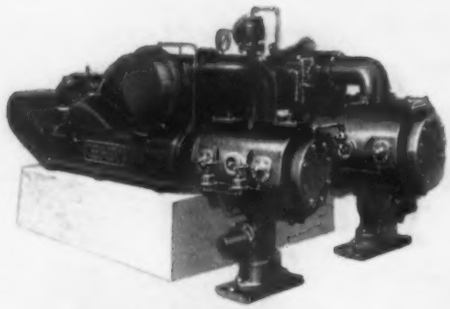
Condensers and vacuum pumps for every service.

Branch Offices in the United States

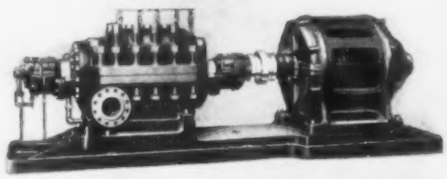
Atlanta	Duluth	Picher
Birmingham	El Paso	Pittsburgh
Boston	Hartford	Pottsville
Buffalo	Houston	San Francisco
Butte	Knoxville	Salt Lake City
Chicago	Los Angeles	Scranton
Cleveland	Newark	Seattle
Dallas	New York	St. Louis
Denver	New Orleans	St. Paul
Detroit	Philadelphia	Tulsa
		Washington



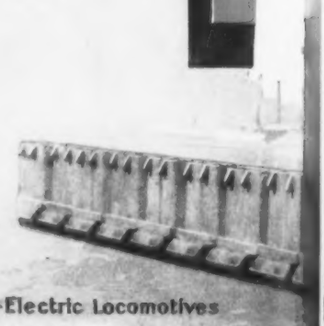
Turbo Blowers and Compressors



Air and Gas Compressors



Centrifugal and Direct-Acting Pumps



Oil-Electric Locomotives

Quality Equipment Pays Dividends

Production costs are kept low by machines and tools that operate economically. The greatest economy is secured from machines which require a minimum of power, repairs, and supervision.

Ingersoll-Rand machines are made to give such service. Quality is built into them in the form of superior design, materials, and workmanship. Thorough inspection of all parts and ample testing of the completed machines assures proper operation on the job.

This care in manufacture produces equipment which will stand up under the most severe operating conditions. High efficiency is maintained throughout a long life, keeping operating costs at a minimum.

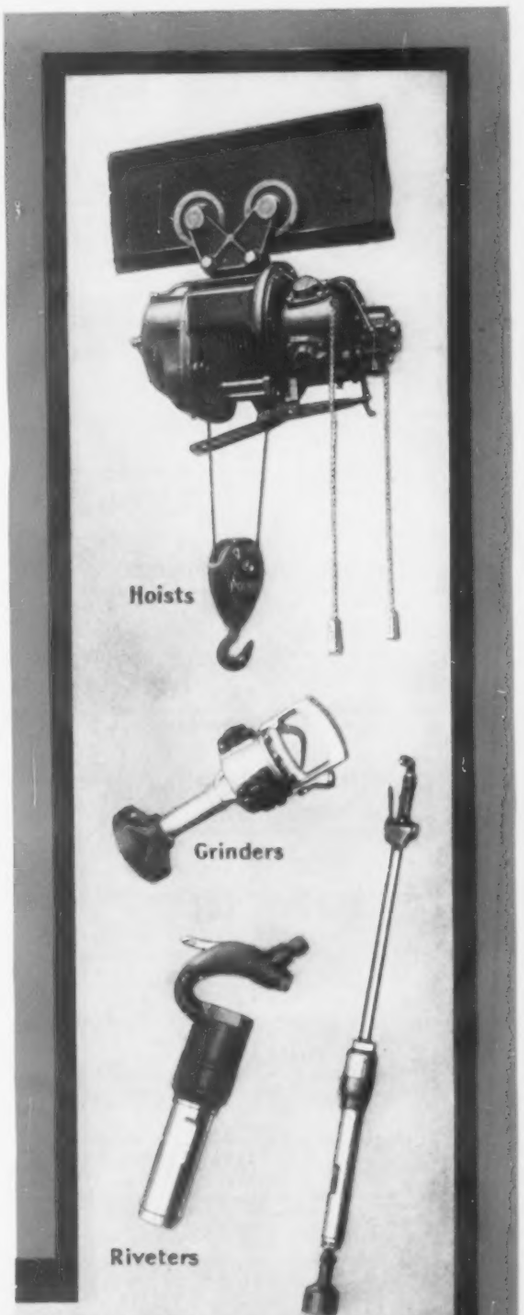
Many thousand I-R machines and pneumatic tools are used in steel mills, foundries, and metal working plants in all parts of the world. These plants have found that the quality-built I-R equipment pays dividends.

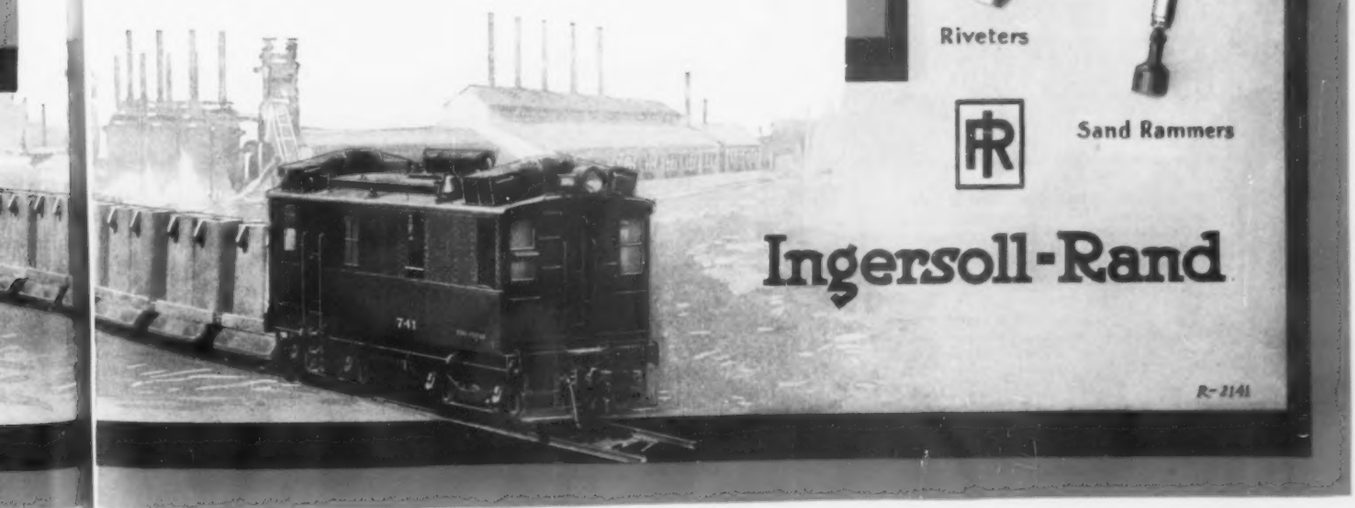
INGERSOLL-RAND CO., 11 Broadway, New York City

Branches or distributors in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited
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Ingersoll-Rand

R-2141

BEAVER
HIGH SPEED STEEL
A High Speed Steel Recognized as a Standard

CO-CO
TURNING STEEL
A Cobalt High Speed Steel for Hard Materials

COLONIAL No. 3
H.H. STEEL
A Tungsten Die Steel for Hot Work

STAINLESS
TYPE -
Made in Five Compositions

O-HI-O
AIR HARDENING STEEL
An Air Hardening High Carbon-High Chromium Die Steel

COLONIAL No. 35
HOT DIE STEEL
A Chromium Die Steel for Hot Work

TUNGO
PUNCH AND CHISEL STEEL
A Proven Tungsten Chisel Steel

COLONIAL SIX
OIL HARDENING STEEL
An Oil Hardening, Non-Deforming Tool Steel

RED STAR TUNGSTEN
TOOL AND DIE STEEL
A Tungsten Alloy Die Steel

COLONIAL No. 7
TOOL STEEL
A Crucible-made Carbon-Vanadium Tool Steel

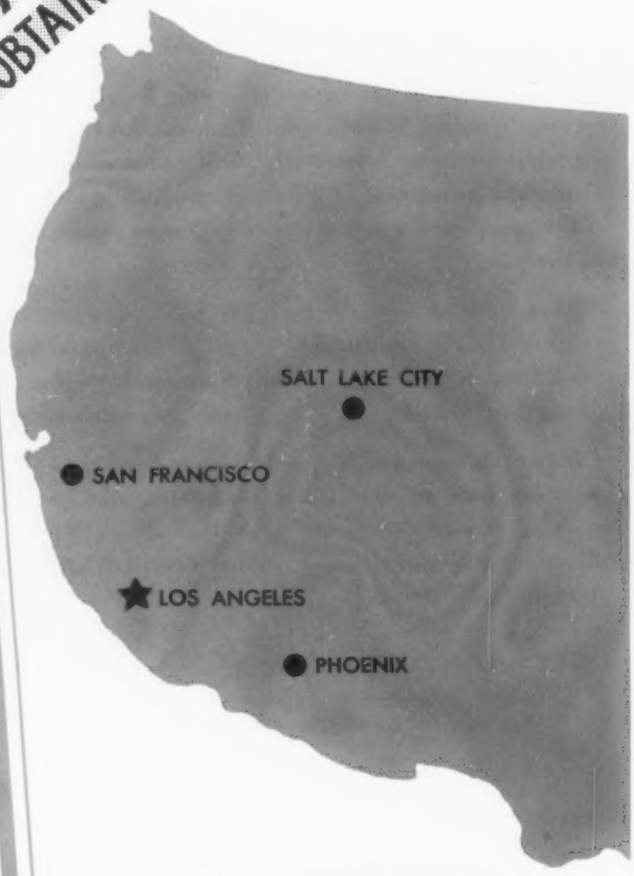
COLONIAL No. 14 SPECIAL
TOOL STEEL
A Crucible-made Carbon Tool Steel

SIL-MAN
SHOCK RESISTING TOOL STEEL
A Tough and Wear Resistant Silico Manganese Steel

RED STAR
TAP STEEL
A Carbon Tool Steel of Highest Quality

RED STAR
TOOL STEEL
A Standard Carbon Tool Steel

A TOOL STEEL FOR OBTAINABLE THROUGH A NATIONAL



QUICK SHIPMENTS

On short notice from large stocks at our various warehouses in principal cities.

COLONIAL STEEL COMPANY
PITTSBURGH - - - PENNA.

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VANADIUM-ALLOYS STEEL CO.
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Red Cut Superior HIGH SPEED STEEL
The Nationally Known, First Quality High Speed Steel for general requirements

Red Cut Cobalt HIGH SPEED STEEL
A Super High Speed Steel of maximum efficiency on certain special operations

MARVEL HOT DIE STEEL
A Tungsten Die Steel preeminent for hot work

STAINLESS NON-CORROSIVE STEEL
A Stainless and Non-Corrosive Steel manufactured under the patents of the American Stainless Steel Co.

CROCAR DIE STEEL
A High Alloy Punch and Die Steel for Severe Service

CHOICE HOT DIE STEEL
A Die Steel for hot work particularly adapted for Header, Gripper and similar hot dies

PAR - EXC DIE PUNCH & CHISEL STEEL
Our best Punch and Chisel Steel, also excellent for hot working dies subject to shock

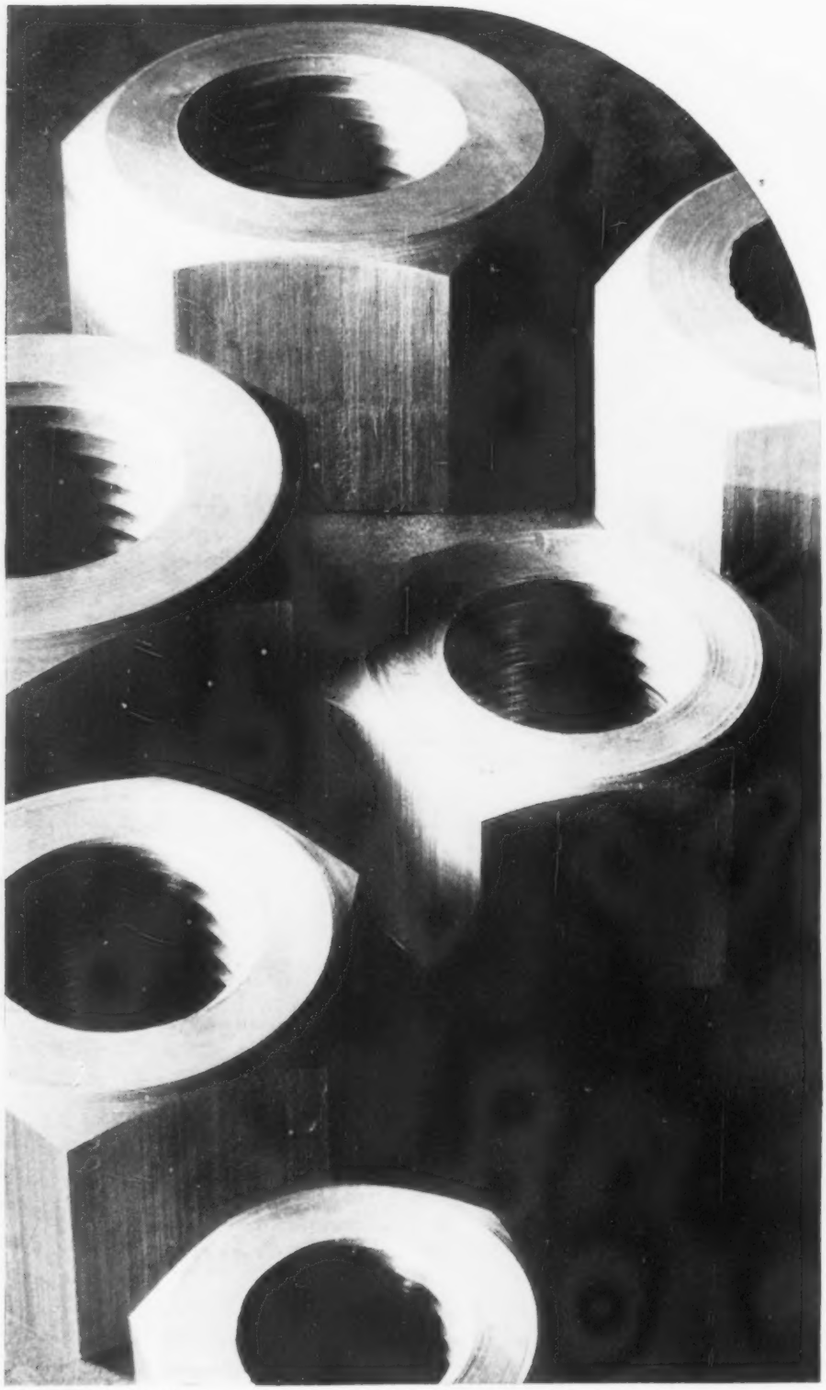
NON-SHRINKABLE DIE STEEL
An Oil Hardening, Non-deforming Die and Tool Steel

VANADIUM TOOL STEEL
A General Utility Tool Steel in various carbon contents, particularly adapted to resist shock, strain and fatigue

COLHED COLD HEADING DIE STEEL
A Steel Especially Processed for Cold Heading Dies

SPECIAL TOOL STEEL
A Carbon Tool Steel of the highest quality and carrying vanadium, furnished in all tempers

LATROBE TOOL STEEL
Our best and only grade of High Quality Straight Carbon Tool Steel, furnished in all tempers



BOURKE-WHITE PHOTO

RUSSELL, BURDSALL & WARD BOLT & NUT COMPANY

BIG NUTS are not difficult to make, but their production in large volume according to rigid specifications requires an alert organization and specialized machinery. R-B-W customers who use big nuts re-order from us year after year because they are satisfied with the uniform quality of the product and the savings realized by our large-scale production. If you have a manufacturing problem involving the use of big nuts, R-B-W probably has the answer.

LOOK INTO this possibility for important savings in your bolt and nut costs. R-B-W service and skill in the design and manufacture of EMPIRE bolts and nuts have been the means of saving thousands of dollars annually for our customers. "*You saved us 18 cents a nut, and gave us a better job,*" a famous locomotive manufacturer wrote us after using his initial order of EMPIRE regular-finished nuts. New standards and new records of time-saving are meeting the exacting demands of American industries. This outstanding service is assured every user of R-B-W EMPIRE bolts and nuts. Inquiries involve no obligation. *Address our nearest office*... Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., Rock Falls, Ill., Coraopolis, Pa. *Sales offices at* Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

AN ANNOUNCEMENT

to PRODUCTION EXECUTIVES *and* DESIGNING ENGINEERS



VERSATILE equipment can be no more versatile than the merits of its component parts. More and more, you are being called upon to combine in the small parts which you produce such widely divergent properties as—*great strength, under both normal and excessive temperatures—high resistance to corrosion—shock and abrasion resistance* —or *absence of aging changes.* Often, too, one or all of these properties must be had in *lighter sections, without sacrifice of strength*—and necessarily *with a minimum of machining and finishing expense.*



ALUMINUM BRONZE STRONGER-THAN-STEEL DIE CASTINGS

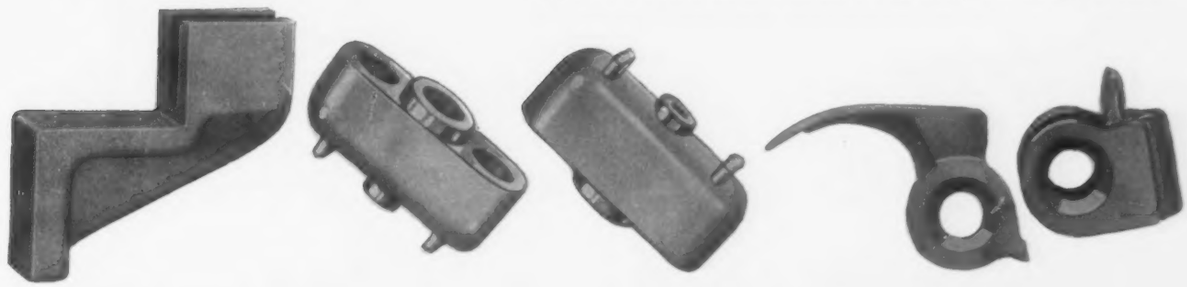
have proven their ability to give any or all of the above properties in a wide variety of uses. To tell you how well and how widely within the compass of this page is impossible. Consequently, we are preparing a series of bulletins which will give complete information, and we know you will want this information so that you may be kept fully abreast of the rapid developments being made in Aluminum Bronze Die Castings. Our engineers will be glad to give specific information—entirely without obligation—and a request on your business stationery will bring you our first bulletin by return mail.



AURORA METAL COMPANY

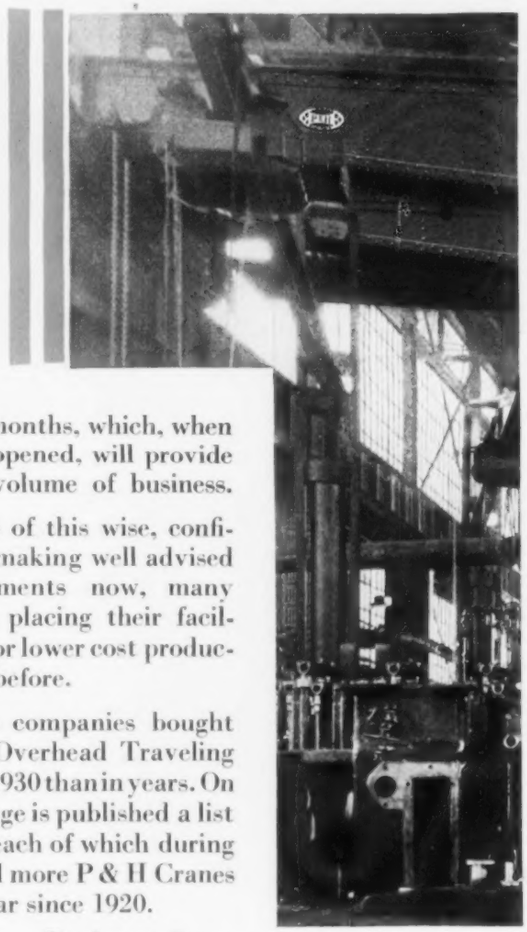
Incorporated

616 West Park Ave., Aurora, Illinois, U.S.A.



Confidence

Leaders of American Industry in 1930 Purchased More P & H Overhead Traveling Cranes than in any year since 1920



It is the history of industry that through every period of stringency certain companies have gone right ahead with an abiding confidence in the future.

Such companies never lose consciousness that every period of inflation is followed by a natural reaction of depression, *and that each depression is in turn followed by good times.* The long view always reveals prosperity ahead.

Thus, in the period of stringency, now passing, many forward-looking companies are seizing the advantage of this buyer's market to purchase plant equipment advantageously. They know full well that a reservoir of orders has been built up during recent months, which, when the gates are opened, will provide a substantial volume of business.

As an instance of this wise, confident policy of making well advised capital investments now, many companies are placing their facilities in shape for lower cost production than ever before.

Some of these companies bought more P & H Overhead Traveling Cranes during 1930 than in years. On the opposite page is published a list of companies, each of which during 1930 purchased more P & H Cranes than in any year since 1920.

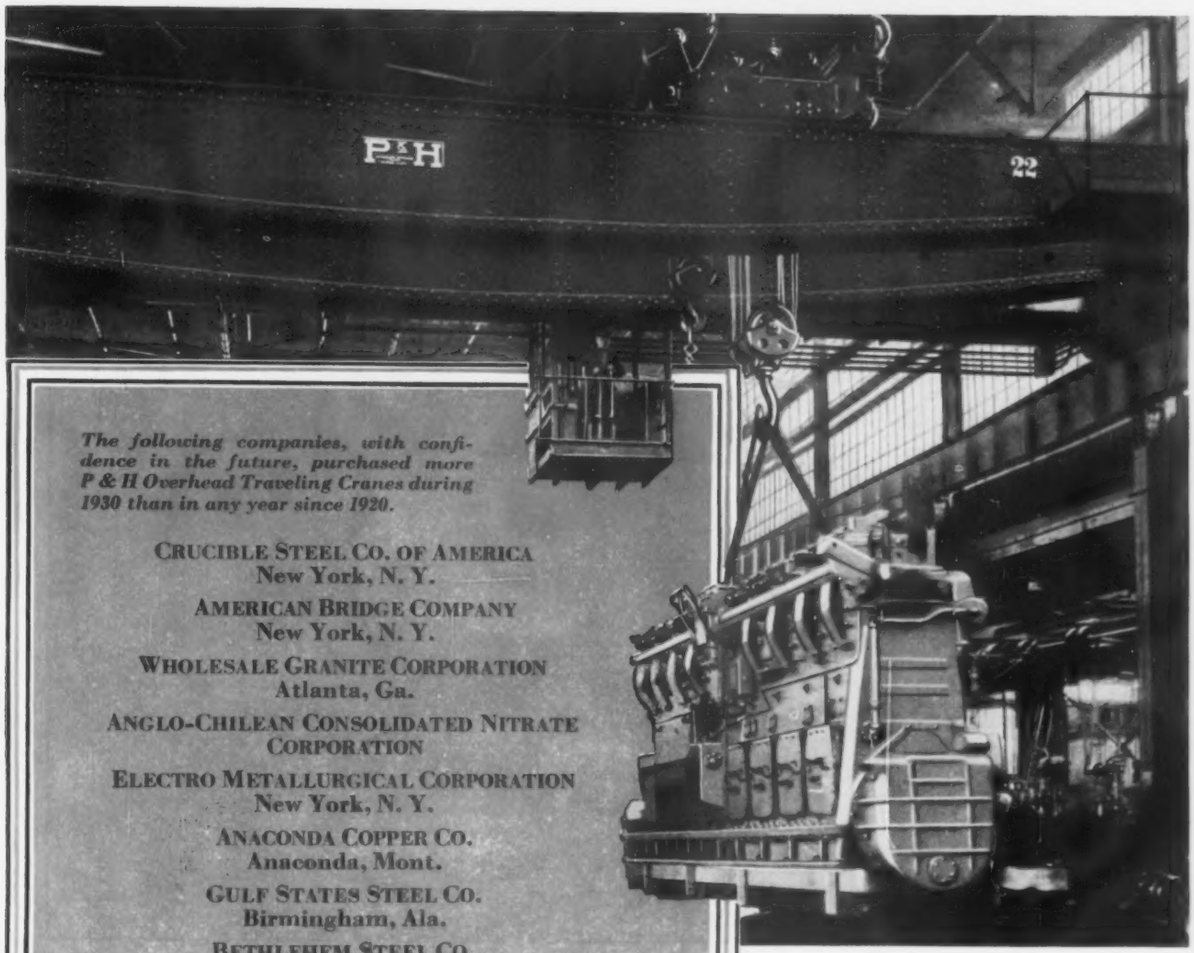
Let P & H Crane Engineers figure on your specifications.

HARNISCHFEGER CORPORATION
Established in 1884
Oldest and Largest Builder of Overhead Traveling Cranes
4401 W. National Ave., Milwaukee, Wis.
Offices and Agents in All Principal Cities

P & H

Overhead Traveling
CRANES

in the Future



The following companies, with confidence in the future, purchased more P & H Overhead Traveling Cranes during 1930 than in any year since 1920.

CRUCIBLE STEEL CO. OF AMERICA
New York, N. Y.

AMERICAN BRIDGE COMPANY
New York, N. Y.

WHOLESALE GRANITE CORPORATION
Atlanta, Ga.

ANGLO-CHILEAN CONSOLIDATED NITRATE CORPORATION

ELECTRO METALLURGICAL CORPORATION
New York, N. Y.

ANACONDA COPPER CO.
Anaconda, Mont.

GULF STATES STEEL CO.
Birmingham, Ala.

BETHLEHEM STEEL CO.
Bethlehem, Pa.

TENNESSEE COAL, IRON & R. R. CO.
Birmingham, Ala.

GRANITE CITY STEEL CO.
Granite City, Ill.

TENNESSEE COPPER CO.
Copperhill, Tenn.

JEFFREY MFG. CO.
Columbus, Ohio

TEXAS COMPANY
New York, N. Y.

JONES & LAUGHLIN STEEL CORPORATION
Pittsburgh, Pa.

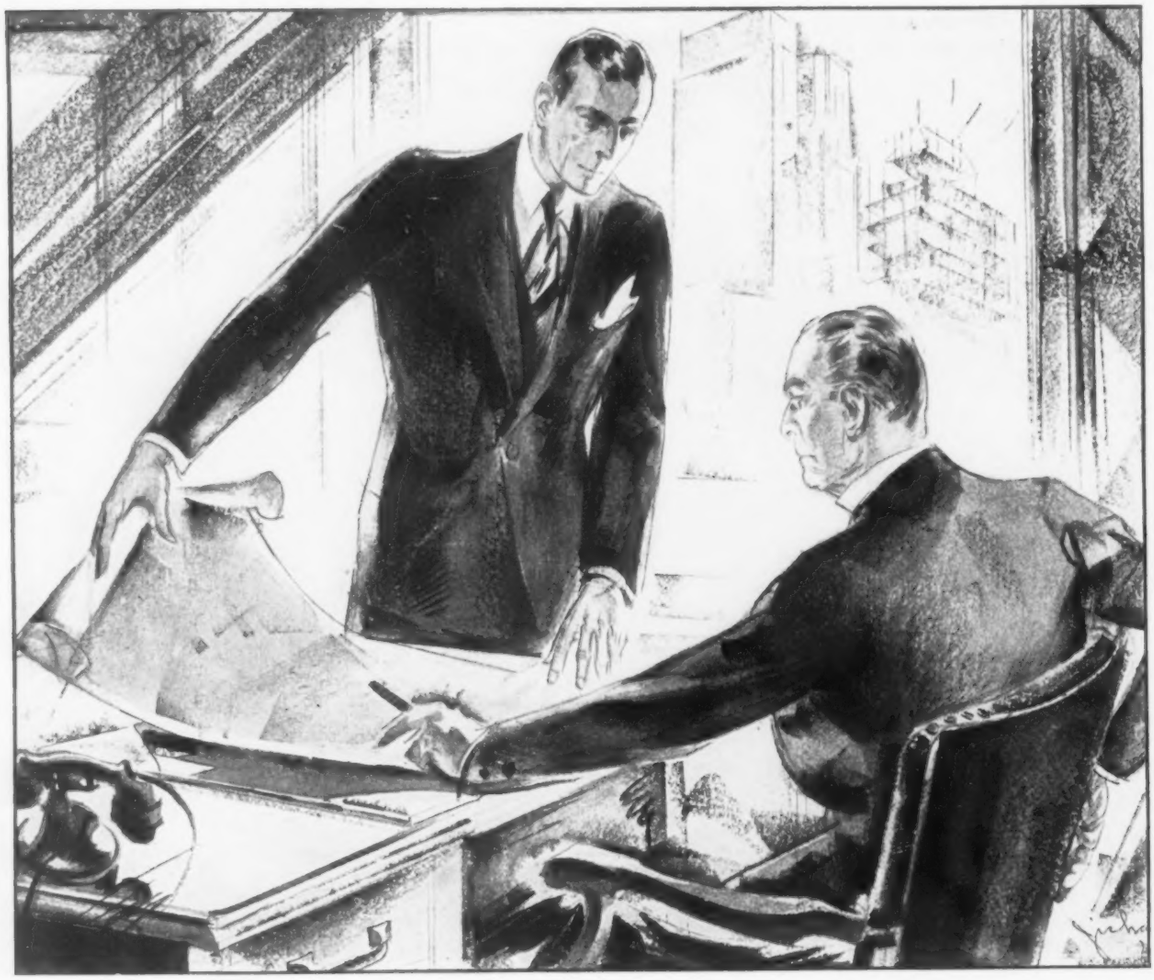
INDUSTRIAL CRANES

P & H Crawler Cranes go anywhere. Not confined to tracks. Can be equipped as Crane, Magnet, Clamshell, Dragline or Shovel. Write for bulletin.



A-5200

. YOUR CANNOT GIVE YOU THIS



ARMCO PLANTS
Middletown, Columbus, and Zanesville,
Ohio; Butler, Pa.; Ashland, Ky.
Joint Plant at Hamilton, Ohio

Back of this familiar symbol is nearly thirty years experience in the making of special analysis iron and steel sheets and plates. When you need a rust-resisting, low-cost metal be sure to see this triangle and the words "Armco INGOT IRON." It is your assurance of adequate and dependable service.

WORLD'S LARGEST EXCLUSIVE PRODUCER OF SPECIAL

BANKER VITAL INFORMATION

...and yet it is just as important to your business as financial advice

When you need expert investment advice, you intuitively turn to your banker. He is a mighty tower of strength, an unfailing guide in time of financial perplexity.

Investing wisely in iron and steel sheets and plates is another problem, and often just as perplexing if the investment is to be sound and profitable. Here, Armco can show you the way to economy and efficiency, and an adequate return from every dollar spent.

Whether you require special electrical sheets, or heavy-duty, rust-resisting plates, the selection is measured strictly by the purpose. And back of your purchase is the cumulative experience of the world's *first* and *largest* exclusive producer of special analysis iron and steel sheets and plates.

You will find at Armco the alertness, dependability and resourcefulness that are so important in establishing a standard source of supply.

Yours may be a great automotive company, requiring thousands of tons of uniform steel sheets of special analysis, precise tempers and flawless finish. . . . Or a small foundry seeking rust-resisting sheets for long-time weather protection. Whatever it is in sheets and plates and pipe, Armco can supply it, promptly and satisfyingly.

In all this, Armco chemists, metallurgists and research engineers—highly trained and experienced—are at your disposal. They are your "bankers in metal"—men who will help you realize the greatest possible dividends from your investment. Any of the offices shown below will welcome your request for their services. Write to them.

THE AMERICAN ROLLING MILL CO.
Executive Offices, Middletown, Ohio
Export: The ARMCO International Corporation

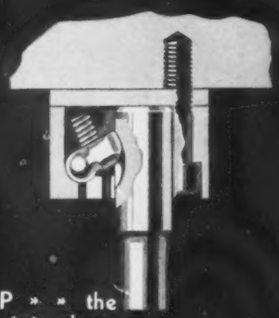
District Offices
Chicago—Cincinnati—Cleveland—Detroit—New York
Philadelphia—Pittsburgh—St. Louis—San Francisco

ARMCO

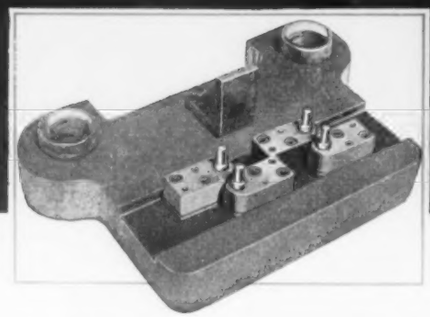
PRODUCERS OF
ARMCO IRON AND STEEL SHEETS
FOR EXACTING PURPOSES

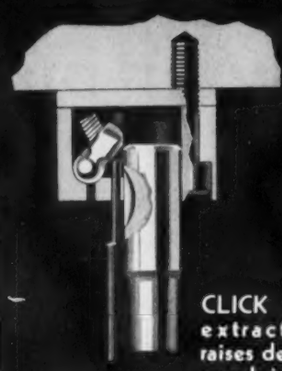
ANALYSIS IRON AND STEEL SHEETS AND PLATES

PUNCHES
INTERCHANGEABLE
AS DRILLS



SNAP » » the punch is in place, rigid and secure!





CLICK » » » extractor pin raises detent » » punch is free and easily removed!

HOLDS SECURELY



RELEASES FREELY

HERCULES Interchangeable Punches and Retainers offer the same speed, simplicity and economy of interchangeability you have always enjoyed in drills.

With this modern system, punches are changed without removing dies from the press or stopping production for more than a moment. Set-ups are quicker and easier. Punches may be had from stock with round, oblong, square or hexagonal piercing point. Such standardization contributes far reaching economies.

Hercules Interchangeable Punches cannot jam or pull out of retainers — but are always freely removed at will. They are held in positive and rigid alignment and introduce a new standard of accuracy in punching practice.

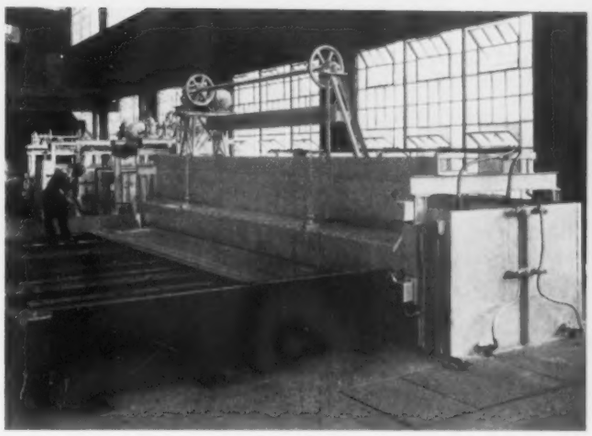
Let us show you how they may be applied to your work. Valuable punch information in catalog No. 94—write for a copy today.

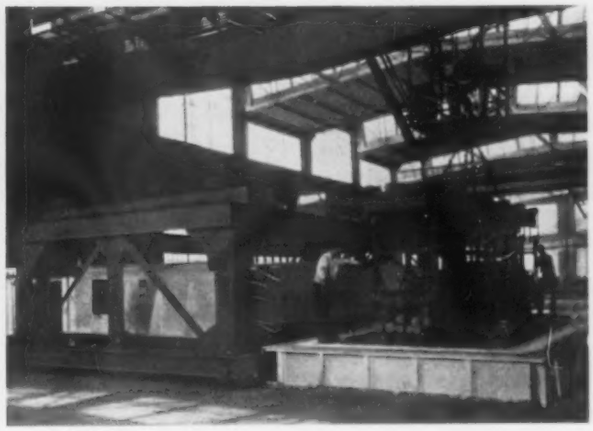
W&B TESTED AND PROVED

WHITMAN & BARNES
INCORPORATED
NEW YORK DETROIT CHICAGO
MAKERS OF FINE TOOLS FOR 76 YEARS

HERCULES INTERCHANGEABLE PUNCHES AND RETAINERS

All-Electric Heat-Treating Equipment contributes *to the* Bethlehem  excellence of Steels . . .





At left, pre-heating chamber of the roller-hearth furnace. At right, two electrically-heated pit annealing furnaces, showing charge being lowered into one.

ALL-ELECTRIC heat-treating equipment has been recently installed in the alloy steel plant at Bethlehem, greatly increasing the accuracy and uniformity of the heat treatment of Alloy and Special Steels.

Regardless of what a manufacturer's requirements may be in the line of alloy, special or corrosion-resisting steels, Bethlehem can supply the right steel for the task. Constant research and improvement in methods of manufacture enable Bethlehem not only to keep abreast of the rapidly-changing requirements of steel consumers, but in many cases to anticipate these requirements and open the way for making finer products by offering better and more easily worked steels.

Bethlehem alloy, special and corrosion-resisting steels are made with extremely careful attention to the details of manufacture under the supervision of men of long experience, in plants equipped with every modern facility, of which the heat-treating plant mentioned above is an example.

Whatever you need in steel—strength, endurance, resistance to corrosion, heat, wear, shock or fatigue—you will find a Bethlehem steel for the job.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

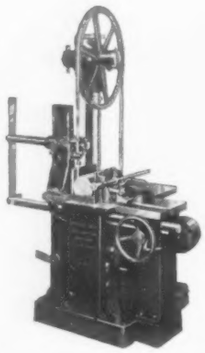
Pacific Coast Distributor: PACIFIC COAST STEEL CORPORATION, San Francisco, Los Angeles, Portland, Seattle, Honolulu

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City

. . OUTSTANDING SPECIAL-PURPOSE STEELS MADE BY BETHLEHEM ARE MAYARI NICKEL-CHROMIUM STEELS, BETHALON AND OTHER CORROSION-RESISTING STEELS. SUPERTEMP AND RESILIA.

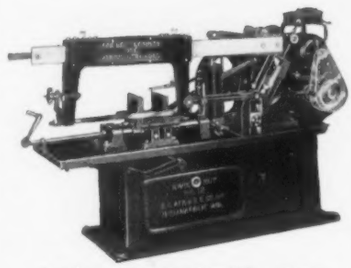
BETHLEHEM Alloy, Special & Corrosion-Resisting STEELS

ATKINS SILVER STEEL SAWS
AND
MACHINES
FOR
METAL CUTTING



The Atkins No. 4 Metal Band Saw Machine cuts metal economically, effecting a noticeable saving in time and material.

Your inquiries and orders for Atkins Metal Cutting equipment are solicited on a *comparative* basis. In other words we want you to compare the results received from Atkins metal cutting saws, machines and grinding wheels with other brands for a true test of quality.



Atkins No. 18 Kwik-Kut Power Hack Saw Machine carries many patented features which reduce operating costs. This machine uses all of the blade, while other types utilize only about 40% of the saw.



Atkins Alloy Metal Band Saws wear longer and cut faster because of excellent workmanship, a super-quality steel and years of experience.

If you are not already using ATKINS, give us a trial next time. Remember that Atkins SILVER STEEL Hacksaw Blades with the Blue End are guaranteed to cut *six times more metal* than any so called Tungsten blade of the same dimensions.



Atkins Hack Saw Frames are sturdy well designed tools. Patterned to direct the entire force of stroke on the cutting edge.



Atkins SILVER STEEL Power Hack Saw Blades with the Blue End are guaranteed to cut six times more metal than any so-called tungsten blade of the same dimensions.

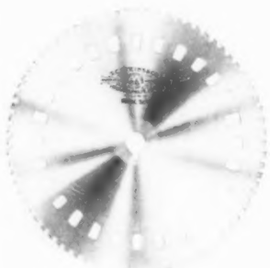
Your natural desire for greater profit at lower costs demands that you consider Atkins Saws as standard equipment on your cutting jobs. Send your orders to our nearest distributor or branch.

Send for Latest Atkins Catalog



Atkins SILVER STEEL Hand Hacksaw Blades with the Blue End are also guaranteed to cut six times more metal than any so-called tungsten blades of the same dimensions. A test by many users show that SILVER STEEL Blades are really better than our guarantee.

The Finest *on Earth*



Atkins Circular Metal Cutting Saws are made in all sizes and for every type of machine. Manufactured from the finest quality of steel for that purpose.

E. C. ATKINS AND COMPANY

Manufacturers of Saws, Saw Tools, Files, Machine Knives and Grinding Wheels

ESTABLISHED 1857. THE SILVER STEEL SAW PEOPLE

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402 South Illinois Street, Indianapolis, Indiana

Canadian Factory, Hamilton, Ontario
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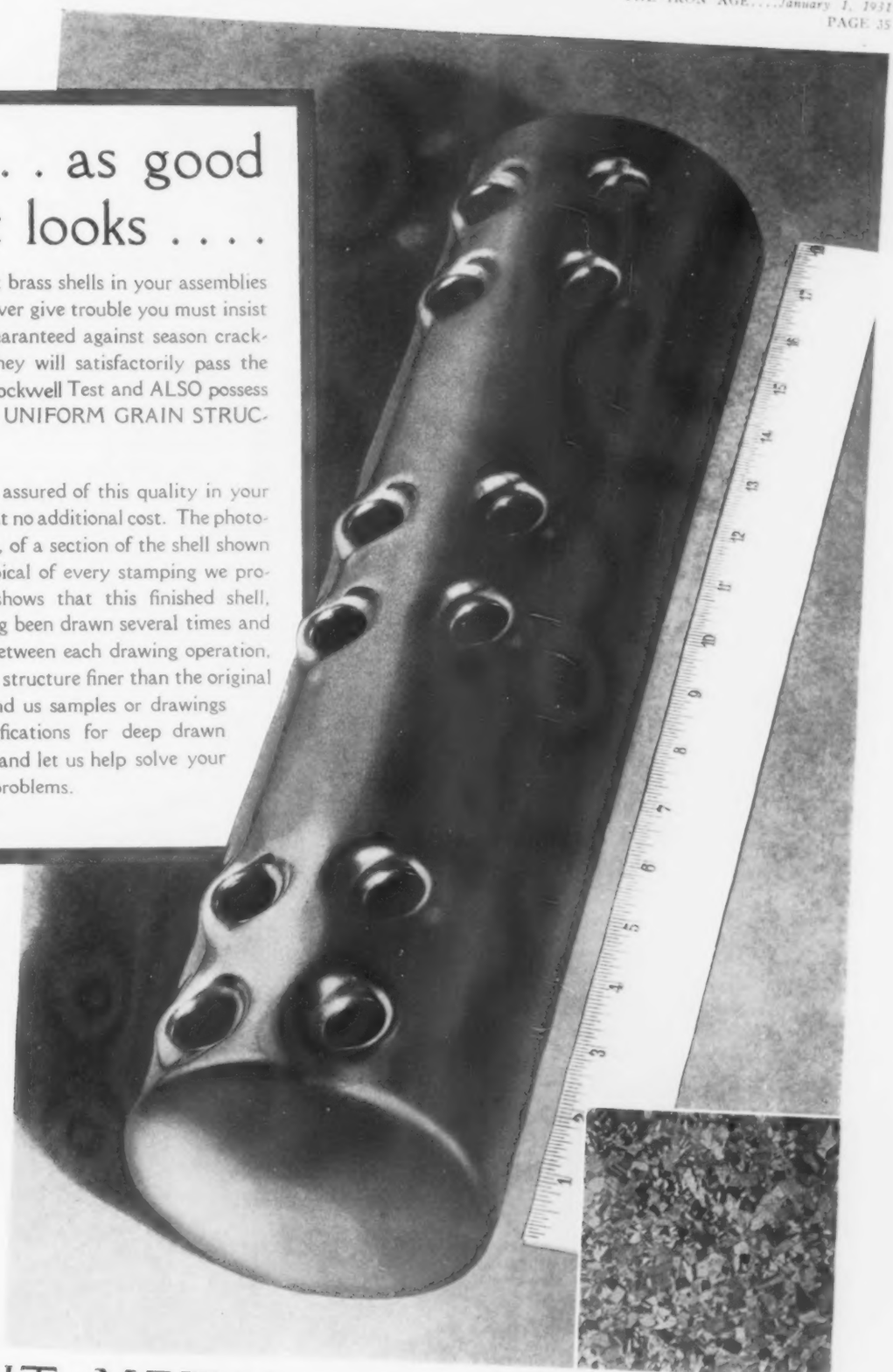


Atkins Acrolite Grinding Wheels are required for sharpening Saws, Knives, Milling Cutters, Shears, and other high tensile strength materials.

. . . . . as good as it looks . . . .

If you want brass shells in your assemblies that will never give trouble you must insist they are guaranteed against season cracking, that they will satisfactorily pass the standard Rockwell Test and ALSO possess a SMALL, UNIFORM GRAIN STRUCTURE.

You can be assured of this quality in your stampings at no additional cost. The photomicrograph, of a section of the shell shown here, is typical of every stamping we produce. It shows that this finished shell, after having been drawn several times and annealed between each drawing operation, has a grain structure finer than the original sheet. Send us samples or drawings with specifications for deep drawn stampings and let us help solve your stamping problems.



A much enlarged photo-micrograph of a section of the above shell showing the fine uniform grain structure

DETROIT METAL SPECIALTY CORP.

DETROIT METAL-BILT PRODUCTS DETROIT METAL SPECIALTY CORP. DETROIT MICHIGAN



The Time to Figure

Now is the time to figure your costs and to determine any possible cost reduction that can be made without sacrifice of quality.

The standardization of all your metal cleaning operations by the use of

Wyandotte
Metal Cleaners

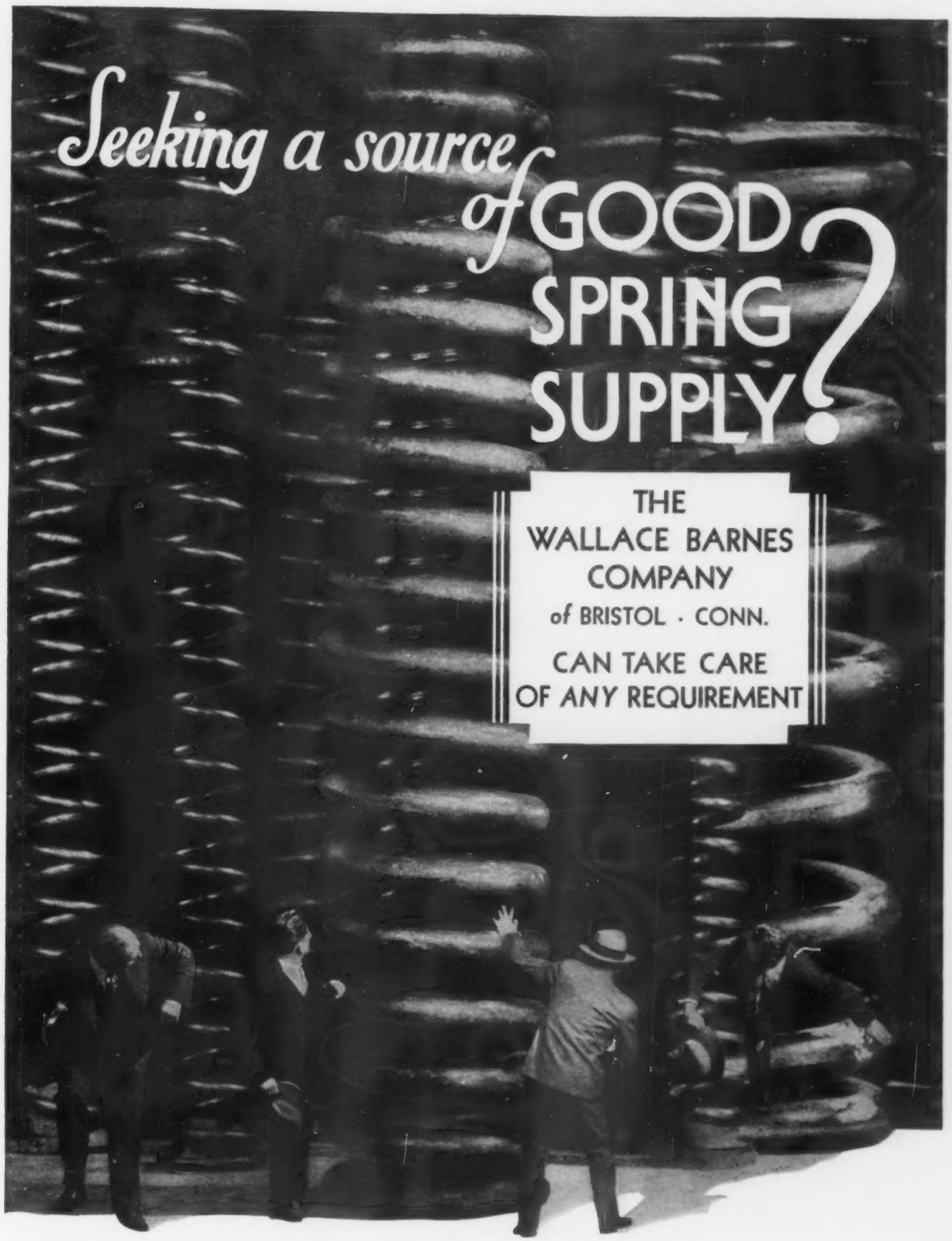
will make a considerable saving and at the same time insure uniform and dependable results.

Such standardization is possible because of the absolute uniformity of the Wyandotte Metal Cleaners. Pick out any one of thousands of barrels and it will deliver a definitely high standard of metal cleaning work at a minimum cost.

An order on your supply man for Wyandotte is a guarantee of economy.

THE J. B. FORD COMPANY, Sole Mfrs.
WYANDOTTE, MICHIGAN




Seeking a source of GOOD SPRING SUPPLY?
THE WALLACE BARNES COMPANY
of BRISTOL · CONN.
CAN TAKE CARE OF ANY REQUIREMENT



SUITABLE SPRINGS

1ST as to quality

2ND as to delivery

3RD as to price

May we quote?

Address inquiries for B-G-R SPRINGS to either division

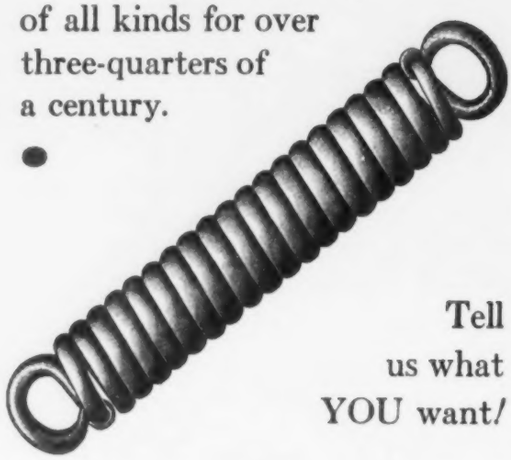
Two Plants for Spring Service

BGR

COOK SPRING CO. DIVISION
OF BARNES-GIBSON-RAYMOND INC
ANN ARBOR, MICHIGAN
DETROIT DIVISION - 6400 MILLER AVE., DETROIT

Experience Counts

We have made springs of all kinds for over three-quarters of a century.



Tell us what YOU want!

The Dunbar Brothers Co.

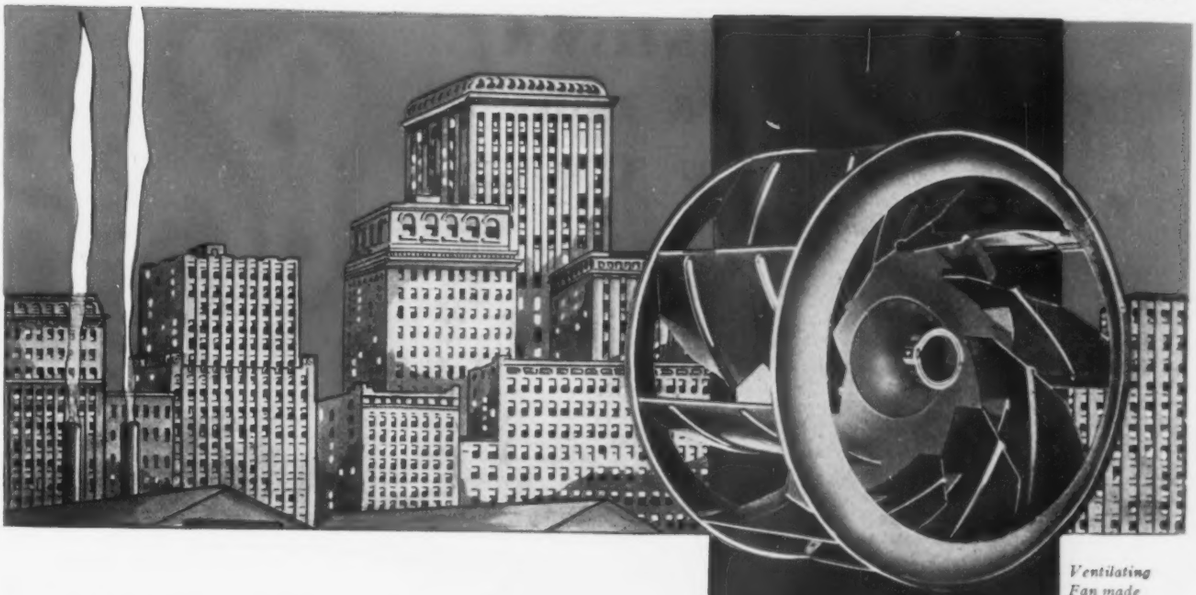
BRISTOL .·. CONNECTICUT, U. S. A.

You can *depend* on GIBSON SPRINGS and STAMPINGS

ANY TYPE OR MATERIAL

WM. D. GIBSON CO.
1800 Clybourn Ave., Chicago, Ill.

SEND FOR OUR CATALOG



Ventilating Fan made from 18 Sheet Steel

CROSBY
SHEET METAL STAMPINGS

1896
35 YEARS IN BUSINESS
1931

OUR THIRTY-FIVE YEARS' uninterrupted progress under the same management is your guarantee of dependable and highly satisfactory stamping service.

Our experience covers a very wide range of work in various types of steel including zinc, brass, copper, duralumin and aluminum.

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General Offices and Works: Buffalo, N.Y.

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Chicago Detroit Cleveland New York
Philadelphia

YOUNGSTOWN SHEET & TUBE COMPANY

A

MAINTAINED FOR

For almost three full decades, from its first scattered orders to its present-day large volume, The Youngstown Sheet & Tube Company has rigorously adhered to its traditional policy of "top quality and close personal service". Deviations from this standard never have been, and never will be tolerated in its dealings.

To our thousands of customer-friends the name Youngstown on the pipe, sheets, conduit, tin plate and other products of our mills has come to be recognized as a symbol of the highest quality. More than that, it has become a synonym for square dealing and close personal service, severed from all red tape.

THE YOUNGSTOWN SHEET

PRODUCERS OF

Iron Ores
Zinc Ores
Coal
Coke and
Coke by-products

MANUFACTURERS OF

Electric welded pipe
Seamless pipe
Standard wrought pipe,
butt-weld and tap-weld
Line pipe
Drill pipe
Drive pipe
Casing
Tubing
Steel sheets of all kinds
Tin plate and tin mill black plate
Steel bars
Steel wire and wire products
Rigid steel conduit,
enameled and electro galvanized

standard

THIRTY YEARS!

Throughout the entire Youngstown organization every customer is regarded as an individual to be served and every order is looked upon as a definite personal obligation. This service to the trade has become a Youngstown tradition and assures every Youngstown customer of receiving not only the utmost value for his dollars but that extra effort and careful regard for details which is so helpful in the emergency.

As we enter another year of service to American industry we wish to express to both our old friends and new, our sincere appreciation for their business in the past. May this coming year be prosperous for all, and may we continue to serve our friends in the trade as in years gone by.

AND TUBE COMPANY

One of the oldest manufacturers of copper-steel, under the well-known and established trade name "Copperoid"

General Offices: YOUNGSTOWN, OHIO

DISTRICT SALES OFFICES

ATLANTA · · · Healey Building
BOSTON · · · · · · Chamber of Commerce Building
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DENVER · Continental Oil Bldg.
DETROIT · · · · Fisher Building
KANSAS CITY, MO. · Commerce Building
LOS ANGELES · 3000 Santa Fe Ave.
MEMPHIS · · · 42 Keel Avenue
MINNEAPOLIS · Andrus Bldg.
NEW ORLEANS · Hibernia Bldg.
NEW YORK · 30 Church Street Hudson Terminal Building
PHILADELPHIA · Franklin Trust Building
PITTSBURGH · Oliver Building
SAN FRANCISCO · · · · 55 New Montgomery Street
SEATTLE · · · · Central Building
ST. LOUIS · · Louderman Bldg.
YOUNGSTOWN · · Stambaugh Building
LONDON REPRESENTATIVE
The Youngstown Steel Products Company, Dashwood House, Old Broad Street, London, E. C. Eng.

GALVANIZED SHEETS PROTECT · SAVE WITH STEEL





Alloy steel and iron bear the brunt

The past decade's revolutionary advance in the application of high speeds, high pressures, and high temperatures to mechanical production and chemical processes has necessitated the working out of a tremendous number of alloy steel and iron analyses, each designed to meet some specific requirement of this new age.

High strength at high temperature . . . high strength combined with light weight . . . complete resistance to corrosion under varying conditions . . . increased wear resistance . . . immunity from the effects of shock and fatigue . . . these are but a few of the manifold demands that are met daily by the proper use of Ferro-Alloys.

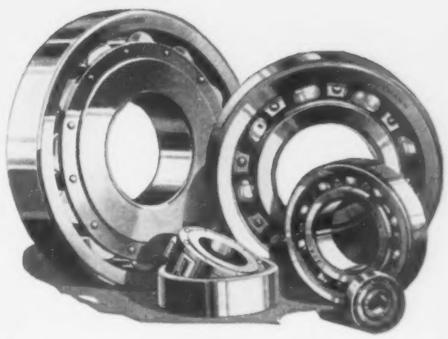
Any metal part used in your product or equipment can be benefited by some one or more of the inherent advantages of Ferro-Alloys. It will pay you to investigate thoroughly the latest developments in high temperature metallurgy and to let Electromet Engineers explain how required physical and chemical properties may be provided by the use of Ferro-Alloys.

Sole Distributors

ELECTRO METALLURGICAL SALES CORP.
Unit of Union Carbide UCC *and Carbon Corporation*
Carbide and Carbon Building, 30 East 42nd Street
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Electromet
Ferro-Alloys & Metals

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FOR BETTER PERFORMANCE

In comparing values, performance should be the determining factor. It is the only true test of worth—gauged not by first cost, but by ultimate cost over a useful life. It is the standard by which true economy must be measured.

In every field of engineering and industry, over a period of twenty years, NORMA-HOFFMANN Precision Bearings have made a distinguished record for dependable stand-up-ability. For greater economy, longer sustained, they stand pre-eminent.

There is a PRECISION Bearing for every load, speed and duty. Let our engineers help you select the type best adapted to your special conditions. And write for the Catalogs.

NORMA-HOFFMANN BEARINGS CORPORATION
STAMFORD CONN., U.S.A.

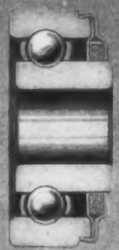
"NORMA-HOFFMANN"
PRECISION BEARINGS

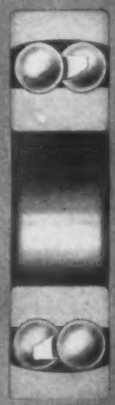

OPEN TYPE BALL BEARING


CLOSED TYPE BALL BEARING


SINGLE ROW SELF-ALIGNING BALL BEARING

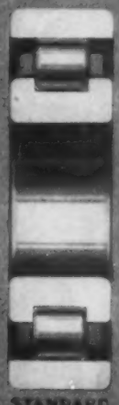

PLATE TYPE BALL BEARING


"GREASEAL" BALL BEARING


DOUBLE ROW SELF-ALIGNING BALL BEARING


ANGULAR CONTACT BALL BEARING


SELF-ALIGNING ROLLER BEARING


STANDARD ROLLER BEARING


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BEARINGS

Information *for the* Man who wants lower operating costs~



"How can I cut the cost on that Job?"—the same old story, but one of vital importance to every production manager.

Many leading manufacturers are cutting costs and improving the product by using Buffalo equipment. If your work involves cutting, drilling or bending metal, investigate the "Buffalo" line of metal-working machinery.

The illustrated bulletins show many new developments recently incorporated in Buffalo metal-working machines. Write for your copies today—no obligation.

This is a good time to bring your files up-to-date. These catalogs will be worth your time. Send for them.

BUFFALO FORGE COMPANY
492 BROADWAY BUFFALO, N. Y.
In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ontario

"Buffalo" equipment for Lower costs

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

ON A

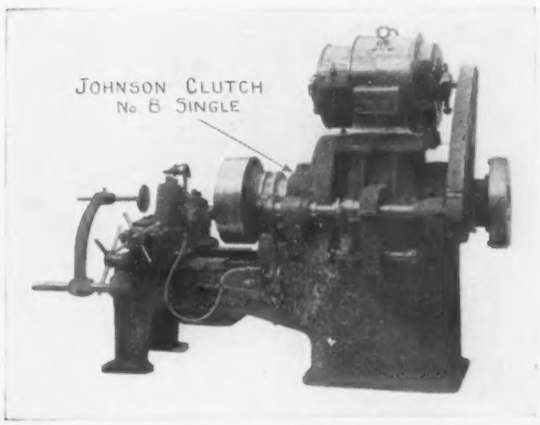
TUBE CUTTING-OFF MACHINE

6 INCH ELECTRICALLY DRIVEN

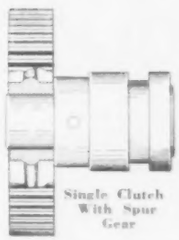
IN GREAT BRITAIN

The JOHNSON CLUTCH is used extensively all over the world on Pipe Threading, Shearing and various types of cutting-off machines. Below is an illustration of how The Charles Winn & Company, Ltd., Birmingham, England, are now using the SUPER-JOHNSON Clutch on their Tube-Cutting-Off Machine.

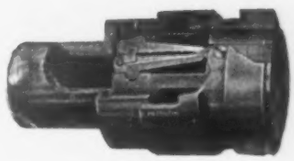
Arrow Points to Clutch Directly Below Motor



Courtesy—Chas. Winn & Co., Ltd., Birmingham, England.



Single Clutch With Spur Gear



Single Clutch Sectioned

SPROCKET USED ON CLUTCH HUB, INSTEAD OF SPUR GEAR ON THIS MACHINE

THE No. 8 SINGLE SUPER-JOHNSON CLUTCH is located at the back of the headstock; the shaft carrying it passes right through the headstock and is operated by the lever at the front or other side of the machine through which lever the operator can start or stop the machine as desired.

This SUPER-JOHNSON Clutch runs 700 r.p.m. and operates on the main drive shaft which is driven from the 5-hp. electric motor by means of sprocket and chain drive which is enclosed in a gear case.

WRITE FOR CATALOG "RED—1"

THE CARLYLE JOHNSON MACHINE CO.

MANCHESTER, CONN.

These cap screws . . . are made to Lamson standards

The most modern machinery built is now in quantity production on this newest member of the Lamson line, making cap screws that measure up to the rigid standards traditional to Lamson's reputation for strength and accuracy.

Lamson bolts, nuts and cotters for generations have enjoyed a reputation for excellence that has been recognized wherever such products are used. Lamson & Sessions therefore could not afford to do otherwise than to make a cap screw of a quality that fully measured up to every requirement of today's production lines, and to its own reputation for highest quality.

When you order Lamson cap screws you may be confident that whatever qualities you expect to find in a cap screw are doubly insured by the Lamson label.

Buy through your Distributor



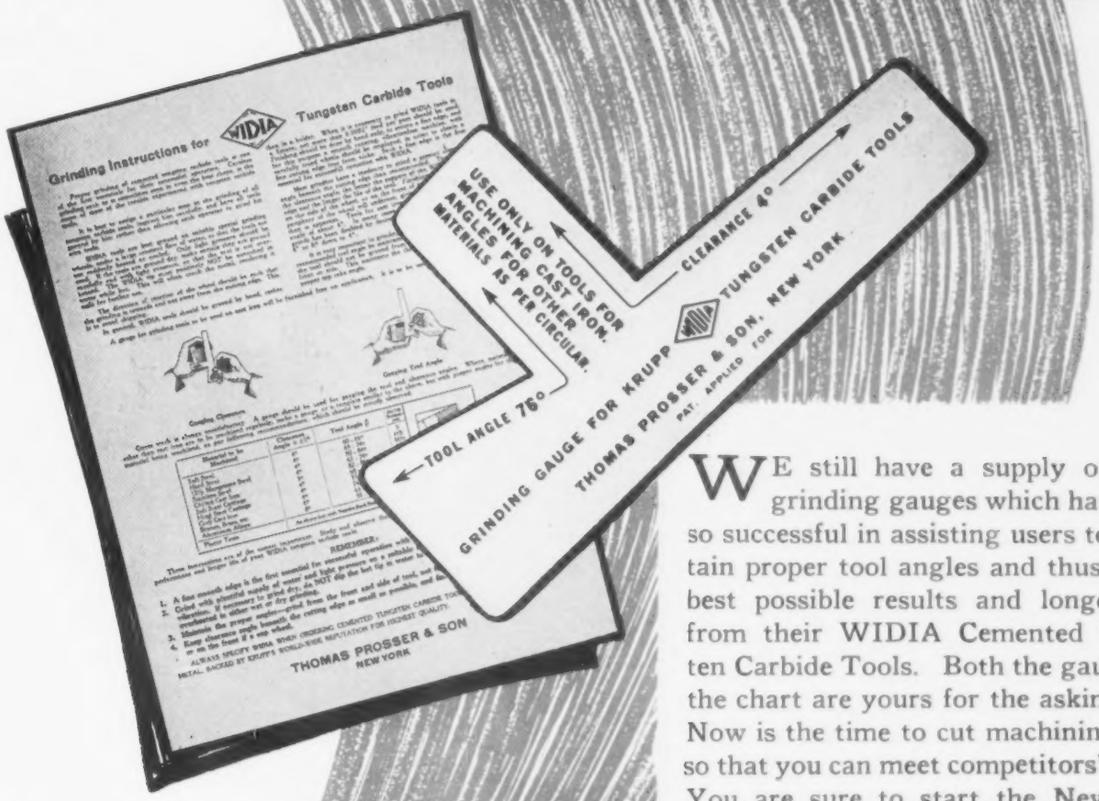
LAMSON & SESSIONS CO.

CLEVELAND, OHIO

Plants at Cleveland and Kent, Ohio; Chicago and Birmingham

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INSTRUCTIONS and GAUGE FOR GRINDING WIDIA TUNGSTEN CARBIDE TOOLS



WE still have a supply of these grinding gauges which have been so successful in assisting users to maintain proper tool angles and thus secure best possible results and longest life from their WIDIA Cemented Tungsten Carbide Tools. Both the gauge and the chart are yours for the asking.

Now is the time to cut machining costs so that you can meet competitors' prices. You are sure to start the New Year right if you are using WIDIA Tungsten Carbide Tools.

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15 GOLD STREET NEW YORK

Branches:
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THOMAS PROSSER & SON, 15 Gold Street, New York

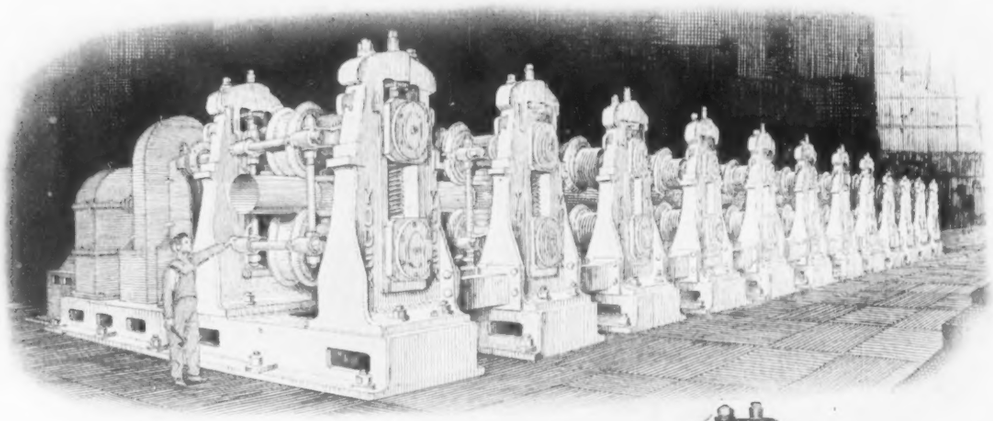
Gentlemen:
Please send me, without cost, Grinding Instructions and Grinding Gauge for WIDIA Tungsten Carbide Cutting tools.

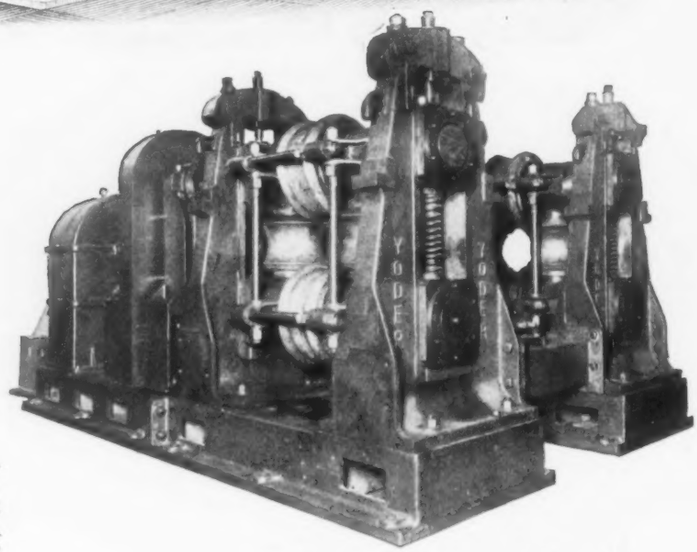
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The Giant of Pipe Machines





Forms 100 ft. of 30" pipe per minute

This machine is backed by over twenty years of experience in developing Cold Roll Forming Machines.

Produces seams suitable for welding.

Equipped with steel housings—hardened and ground rolls—roller bearings.

Our pipe equipment handles all sizes from ⅛" to 30" diameter, and wall thickness from tin plate to ¾".

Designed and built by YODER

Builders of

Gang Slitting Shears—Rotary Shears
Automobile Sheet Metal
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Pipe Forming Machines

Consult our engineers on your sheet or plate problems.

THE YODER COMPANY

W. 55 ST. and WALWORTH AVE. CLEVELAND, OHIO

PLATE AND SHEET METAL MACHINERY SPECIALISTS

STRUCTURAL STEEL CREATED THE SKYSCRAPER

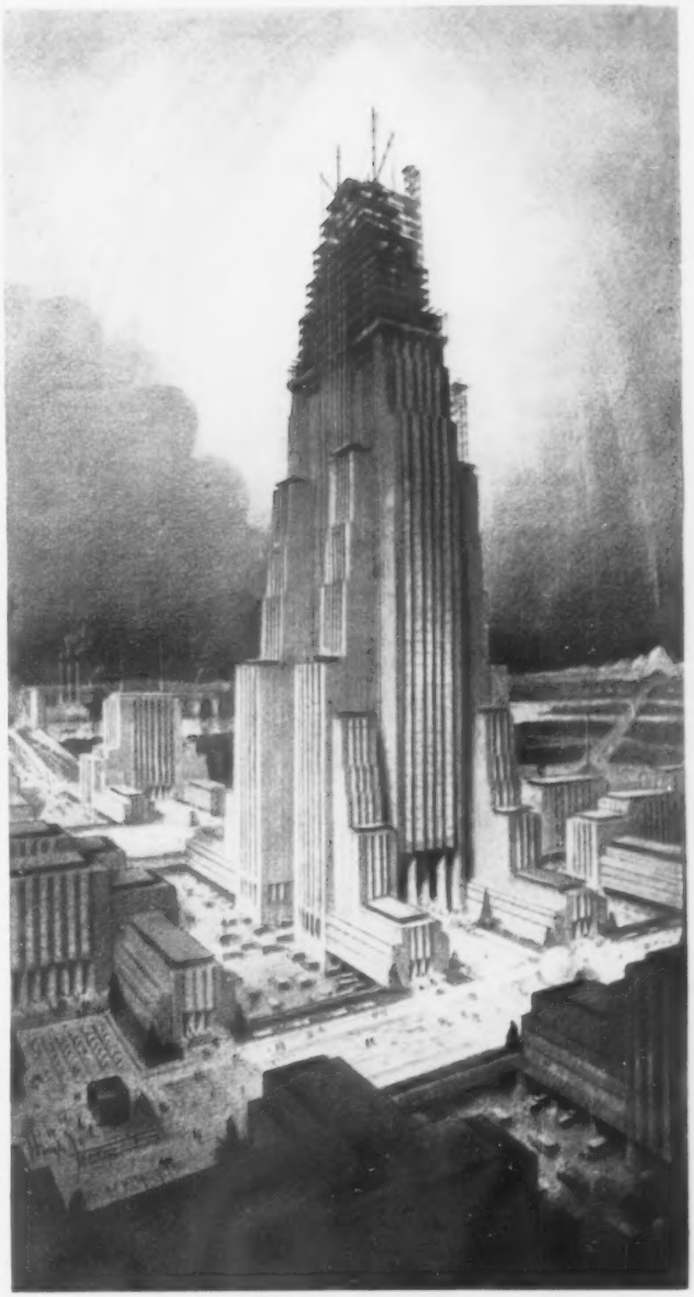
STEEL SOON BEARS RIPE PROFITS

•

THE "cloud-touchers" are steel! Every one knows that now. Knows, too, that the higher spires and more daring spans to come must be steel. Of greater significance is a growing recognition of this fact: The humble building at a skyscraper's base, or the modest bridge astride a rural stream, is ready sooner, serves better and lasts longer when this matchless metal is used.

For steel brings the same speed and economy in construction, the same predetermined strength and security to homes, schools, and small as well as large apartment and mercantile houses, factories and bridges. It comes to a building site ready to go into place. Heat or cold, rain or snow cannot affect it. It is permanent, fire-resistive, cannot shrink. It may be quickly erected wherever and whenever men can work.

Before building anything, find out what steel can do for you. The Institute serves as a clearing house for technical and economic information on steel construction, and offers full and free co-operation in the use of such data to architects, engineers and all others interested.



"MUNICIPAL CENTER FOR CITY OF MEDIUM SIZE." AN ENLARGEMENT OF THIS DESIGN BY HUGH FERRISS, ON SPECIAL STOCK FOR FRAMING, WILL BE MAILED WITHOUT CHARGE TO ANY ARCHITECT, ENGINEER OR BUSINESS EXECUTIVE.

The co-operative non-profit service organization of the structural steel industry of North America. Through its extensive test and research program, the Institute aims to establish the full facts regarding steel in relation to every type of construction. The Institute's many publications, covering every phase of steel construction, are available on request. Please address all inquiries to 200 Madison Avenue, New York City.—In Canada, to 710 Bank of Hamilton Bldg., Toronto, Ontario. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas, San Francisco and Toronto.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

STEEL INSURES STRENGTH AND SECURITY



Include Oxwelding in Your Operating Program

BUSINESS demands maximum economy in plant operation. To ignore the possibilities of oxy-acetylene welding and cutting as a method of economical maintenance, reclamation and repair, is to ignore savings that may mean the difference between profit and loss. Scores of manufacturers, realizing this, are reclaiming thousands of dollars' worth of discarded equipment by oxwelding. For example:

A blast furnace management is saving $6000 a month by oxwelding slightly damaged parts that were formerly scrapped.

A paper mill organization is saving $1080 per boiler by oxwelding worn stoker parts.

A manufacturer, by oxwelding fractured cylinder heads, has restored $3200 worth of equipment to active service.

Managers anxious to eliminate needless waste are invited to investigate the possibilities of oxwelding. The flexibility of the process makes it applicable to every industry. Write today for details.



THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

General Offices · Carbide and Carbon Building, New York

68 Linde Oxygen Plants
51 Prest-O-Lite Acetylene Plants
175 Oxygen Warehouse Stocks

UCC

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WRIGHT

HIGH SPEED HOISTS

LIFE depends on your choice of a hoist. The inspection plate on your Wright Hoist means it is thoroughly tested under 50% over-load, on a long ton basis. ¶ The name "Wright" on your hoist signifies utmost quality of material and workmanship. Speed and ease of operation . . . and, above all, assurance against failure. ¶ There is a Wright Distributor nearby.



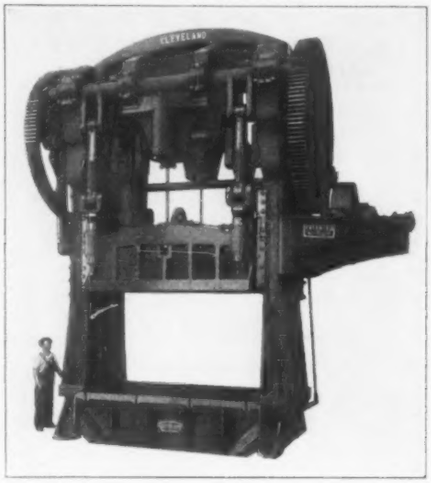
THOROUGHBRED OF HOISTS
CHARACTER · SPEED · STAMINA

WRIGHT MANUFACTURING COMPANY
BRIDGEPORT, CONNECTICUT
An Associate Company of the American Chain Company, Inc.

ACCO

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SERVE INDUSTRY
ECONOMICALLY

CLEVELAND
POWER PRESSES



Nothing will reduce manufacturing costs like the replacement of heavy, costly to machine castings and forgings with stampings and hot pressings. With stampings, less metal is required, less is removed in machining, the work is far lighter, stronger, more durable, more easily repaired.

Cleveland makes Presses to take care of every stamping need from the smallest open back Inclinable to the largest single and double crank Toggle. To this end, our experience in helping with the selection of suitable presses to meet your exact requirements, is freely at your service.

If you are considering the installation of additional Power Presses, let Cleveland engineers furnish you with the complete specifications covering Clevelands—check them point by point against any other specifications and you will readily understand why the demand for Clevelands is constantly increasing.

CLEVELAND
FABRICATING TOOLS

Cleveland Fabricating Tools and Small Tools have been recognized as standard equipment by the majority of fabricators for fifty years.

There is every variation of size, capacity and type; every refinement for quicker, safer operation; every provision for longer life and greater strength in Cleveland Fabricating Tools.

Punches, Shears, Bending Rolls, Plate Planers, Wall Radial Drills, Rotary Planers, etc.



THE CLEVELAND PUNCH & SHEAR WORKS CO.
CLEVELAND OHIO, U.S.A.

NEW YORK - CHICAGO - DETROIT - PHILADELPHIA - PITTSBURGH



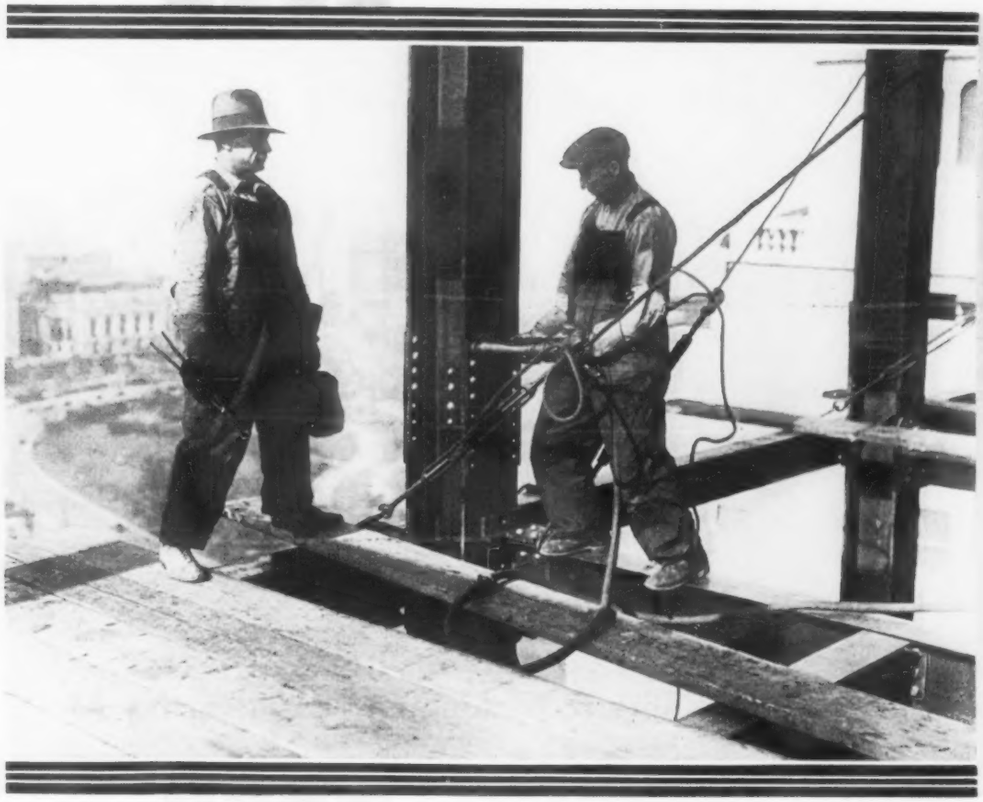
The REGAL LATHE built by LE BLOND

Designed by Le Blond engineers, manufactured by Le Blond men in Le Blond shops, it brings to the light manufacturing, general repair, automotive repair and maintenance fields a popular-priced line of precision lathes, embodying the latest and most efficient engineering principles heretofore found only in higher-priced tools.

There is a size in Regal Lathes to match every requirement.

Organizations serving the repair, maintenance, light manufacturing and automotive fields should write for full particulars on this line, and the Le Blond selling plan.

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MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.







ASK THE MAN WHO DRIVES 'EM » » » »

or the man who heats them . . . both will be unanimous in their approval of rivets made by the Pittsburgh Screw and Bolt Corporation and the Gary Screw and Bolt Corporation. "Fort Pitt" Rivets have a national reputation for quality and uniformity . . . they are produced by the largest manufacturers of Bolts, Nuts and Rivets in the country.

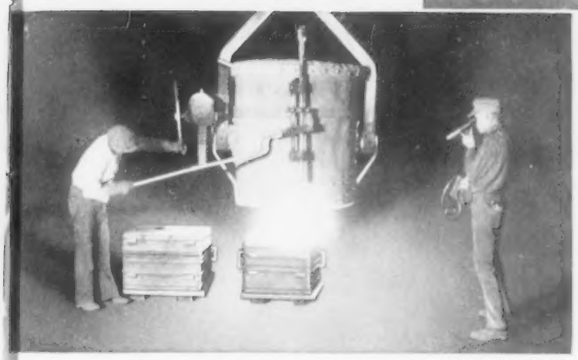
PITTSBURGH SCREW AND BOLT CORP.
PITTSBURGH, PA.

Gary Screw & Bolt Company . . . Chicago

Plants: Continental Works, Chicago — Gary Works, Gary, Ind.
Pittsburgh Works, Pittsburgh — Graham Bolt & Nut Works, Pittsburgh
Sales Offices: Peoples Gas Building, Chicago — 250 Park Avenue, New York

One of the many reasons for Steel Castings by . . .
BONNEY-FLOYD



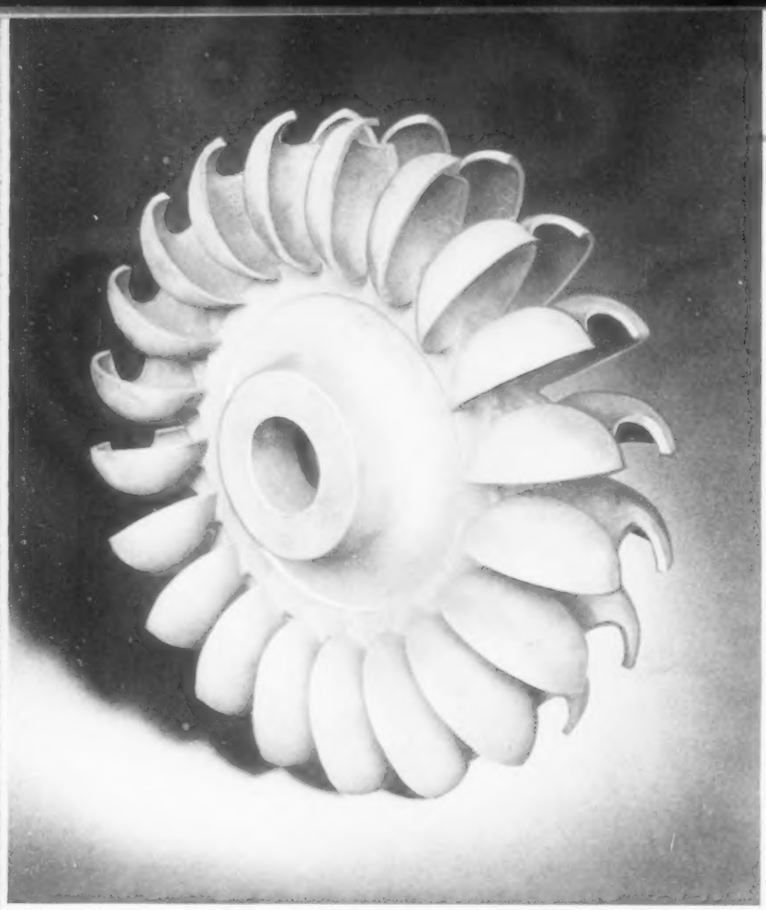


Above is pictured an optical pyrometer in use determining metal temperature BEFORE tapping. When the steel is cast to the molds, the same method of determination is used to check temperatures, as shown at the left.

Casting-Temperature Control at Bonney-Floyd

Steel Castings, to be really excellent, not merely good, must be poured within a narrow temperature range. This range must be appropriate for the size and metal section of the particular piece being poured. Such an important factor in the manufacture of quality steel castings cannot be left to a "melter's eye" or any haphazard method.

At Bonney-Floyd, casting temperature of steel is determined with optical pyrometers before tapping. During the pouring of molds, temperatures are checked by the same method. Photographs reproduced on this page show both these determinations being made under actual production conditions.



THE BONNEY-FLOYD COMPANY
COLUMBUS, OHIO

At the left is shown an 1100-pound impulse-type turbine wheel. Selection of the proper pouring temperature and its accurate control to assure the temperature desired played an important part in the production of this truly remarkable steel casting.

Pouring temperature control at Bonney-Floyd is in the hands of able metallurgists and foundrymen, and constitutes "Another of the Many Reasons for Steel Castings by Bonney-Floyd".

The exacting purchaser of quality steel castings finds attention to this important manufacturing detail of interest; for it contributes largely to uniform excellence, freedom from shrink cavities and other disappointing defects which result from "rule-of-thumb" practice.

Every step of manufacture at Bonney-Floyd's is scientifically regulated.

The Bonney-Floyd Company

COLUMBUS, OHIO

Carbon and Alloy Steel Castings, Differentially Heat-Treated Alloy Steel Castings, Alloy Steel Mine Car Wheels, Links and Self Lubricating Wheels for Pig Casting Machines, Mine Cars, Hardkote Abrasion Resisting Welding Rod

CAPACITY—1400 TONS A MONTH; ELECTRIC STEEL CASTINGS UP TO SIX TONS, OPEN HEARTH CASTINGS UP TO TEN TONS.

Melting Equipment—Two 15-ton Open Hearth and two 3-ton Electric Furnaces

Freight Service—New York Central, Pennsylvania, N. & W., B. & O. Hocking Valley (C. & O., Erie, Nickel Plate, Pere Marquette)

The Maker's Integrity is the Product's Finest Guarantee
Steel Castings Bearing This Mark Are Trustworthy

Haynes Stellite Engineering Service



What it is . . .

IT is a consulting service for progressive machine shops throughout the country. It brings higher efficiency and real economy into your shop. Haynes Stellite engineers, with headquarters in the principal cities, assure prompt attention to your machining problems. They are backed by expert knowledge in modern machine tool practice. Haynes Stellite tools permit increased speeds and feeds. They assure operating costs cut to "the bone" and maximum production at lowest cost per unit piece machined. Write today for further information. Fill out and return the coupon.

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HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

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Haynes Stellite Welding Rod is also available from any of the 42 shipping points of the Oxweld Acetylene Company.

HAYNES STELLITE · HAYSTELLITE · HASCROME · HASTELLOY

Quality Products, Fair Prices, Dependable Supply, Engineering Service

Haynes Stellite Company, Kokomo, Indiana

Without obligation on my part, please send me further information on Haynes Stellite Service.

Name .....

Company ..... Position .....

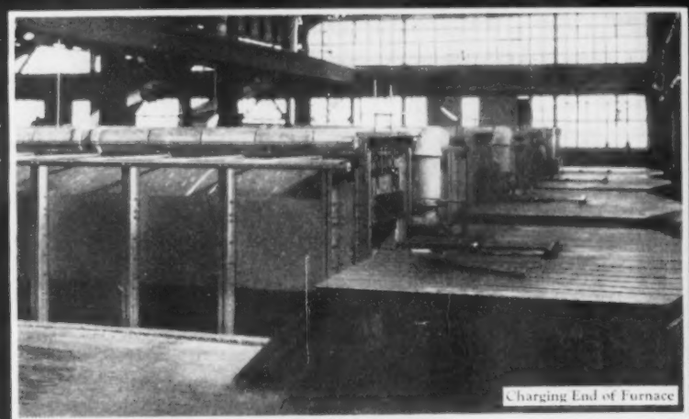
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PACK-HEATING PAIR-HEATING *and* NORMALIZING FURNACES

built or under construction since 1926



Charging End of Furnace

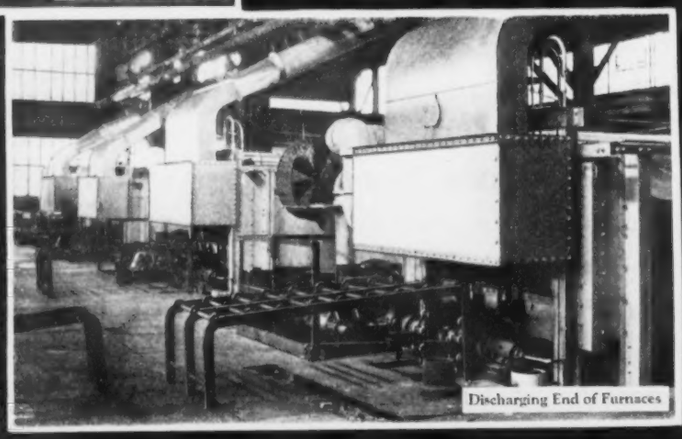
Sheet mill production costs respond so favorably to WEAN Equipment that 99 "Radiant Gap Type" furnace installations have been made in the past four years.

AUTOMATIC TINNING EQUIPMENT
including:

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- Wet Tin Plate Cleaning Units
- Automatic Doublers
- Automatic Cold Roll Piling Machines
- Cold Roll Packers
- Method and Process for Treating Tin Plate
- Republic Mulholland Oscillating Polishing Machines for Chrome Nickel Sheets
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(All the above licensed under patents and patents pending)

- McKay Roller Leveling Equipment
- Sheet Scrubbing Machines
- Sheet Oiling Machines



Discharging End of Furnaces

In addition to "Radiant Gap Type" Furnaces, WEAN Equipment includes cost reducing sheet and tin plate equipment listed at the left.

We will be glad to estimate possible savings obtainable with any of these items in your plant.

THE WEAN ENGINEERING COMPANY, INC.

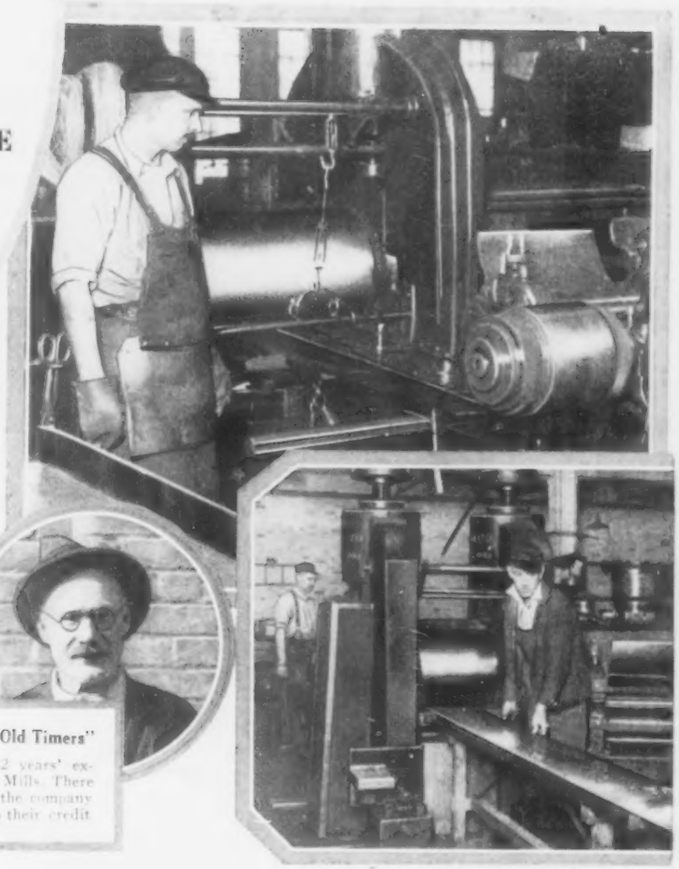
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Flinn & Dreffein Co. — *Associated Companies* — The McKay Machine Co.

Stages
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PHOSPHOR BRONZE
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Fifty-two Years of S Reputable Service

No. 5



Another of Seymour's "Old Timers"

Charles Remeika has 32 years' experience in the Seymour Mills. There are dozens of men with the company with 25 or more years to their credit.

Finish Rolling

From the time the bars leave the casting shop and pass through the various processes of breaking down, overhauling and running down preparatory to finish rolling, with intermediate operations of annealing, cleaning, drying, etc., they are under constant inspection by competent men, thereby assuring that ductility and ease of fabricating, for which Seymour Nickel Silver and Phosphor Bronze are known, used and recommended. Specially prepared paper is placed between finished polished sheets when shipped, in order to protect the surfaces.

THE SEYMOUR MANUFACTURING CO.

SEYMOUR **1878-1930** **CONNECTICUT**

PROGRESS

PEOPLE buy what they want most—as proved by the rapidly mounting sales of the enduring and practical metal called Nirosta. Its brilliant future is already forecast by increased applications featured at national exhibits in many fields.

Exposed on test at tide level to alternating attacks of air and salt water abroad since 1912 without corrosion, this metal has now passed the severest laboratory and service tests conducted by some of America's greatest automotive, oil and other industries.

Nirosta's shining surface defies the elements on the country's loftiest spires. Its non-corrosive properties have made possible the new oil-cracking processes destined to benefit everyone.

It gives hours of service against minutes before, in oil and chemical services . . . . . and has successfully overcome the devastations of acids in the pulp and paper industry. Its beauty and practicability are rapidly increasing the tonnage used for automobiles.

Nirosta is a practical metal—workable at reasonable cost—corrosion resistant to the maximum degree.

HOW TO USE NIROSTA IN 1931

Look over your designs and write us about applications where greater corrosion resistance or enduring beauty would make your product better.

Nirosta patents cover exclusive types of high-chrome nickel steels of varying properties. KA2 is corrosion resistant, made in several analyses, each having varying specifications according to the service required. KNC3 is used for high heat and pressure under corrosive conditions.

A letter will bring you the experience of a decade here and abroad.

FABRICATORS OF NIROSTA ARE INVITED to exhibit products made in whole or in part of Nirosta at the Nirosta Exhibit Room, 2638 New York Central Building, N. Y.—Visited by hundreds of buyers every month and the recognized headquarters for the successful application of chrome nickel steels.



THIS LABEL IDENTIFIES NIROSTA

NIROSTA METAL

NIROSTA METAL PROVIDES MAXIMUM DUCTILITY AND RESISTANCE—ONLY OBTAINABLE WHEN PROCESSED UNDER KRUPP NIROSTA PATENTS BY THESE LICENSEES:

ACME STEEL COMPANY
AMERICAN FORGE CO.
THE BABCOCK & WILCOX TUBE COMPANY
BACON & MATHESON FORGE CO.
BALDT ANCHOR, CHAIN & FORGE CO.
CRUCIBLE STEEL CO. OF AMERICA
DETROIT SEAMLESS STEEL TUBES COMPANY
HENRY DISSTON & SONS, INC.
DRIVER-HARRIS COMPANY
A. FINKL & SONS CO.
FIRTH-STERLING STEEL COMPANY
GLOBE STEEL TUBES CO.
GRIFFIN MANUFACTURING CO.
HEPPENSTALL COMPANY
LUDLUM STEEL COMPANY
LUKENS STEEL COMPANY
MORRIS & BAILEY DIVISION, AMERICAN STEEL & WIRE CO.
THE NEWTON STEEL CO.
THE OHIO SEAMLESS TUBE CO.
PENNSYLVANIA FORGE CORP.
PITTSBURGH STEEL COMPANY
REPUBLIC STEEL CORPORATION
SHARON STEEL HOOP COMPANY
SPANG-CHALFANT & CO., INC.
THE STANLEY WORKS
SUMMERILL TUBING COMPANY
UNION DRAWN STEEL COMPANY
THE WALLINGFORD STEEL CO.

CASTING LICENSEES

THE BABCOCK & WILCOX TUBE COMPANY
THE CALORIZING COMPANY
THE CHAPMAN VALVE MFG. CO.
CHROME ALLOY PRODUCTS, INC.
CLEVELAND ALLOY PRODUCTS CO.
THE DURIRON COMPANY, INC.
ELECTRIC STEEL FOUNDRY CO.
GENERAL ALLOYS COMPANY
MICHIANA PRODUCTS CORP.
MILLBURY STEEL FOUNDRY CO.
MILWAUKEE STEEL FOUNDRY CO.
MONARCH FOUNDRY COMPANY
PACIFIC FOUNDRY CO., LTD.
SHAWINIGAN STAINLESS STEEL & ALLOYS, LTD.
ST. JOSEPH ELEC. STEEL CASTINGS CO.
STANDARD ALLOY COMPANY
WM. J. SWEET FOUNDRY CO.
THE SYMINGTON COMPANY
TAYLOR-WHARTON IRON & STEEL CO.
TEXAS ELEC. STEEL CASTINGS CO.
WARMAN STEEL CASTING CO., LTD.
WASHINGTON IRON WORKS
THE WEST STEEL CASTING CO.

BARS—CASTINGS—FORGINGS—PLATES—SHEETS—STRIP—TUBING—WIRE—AND INNUMERABLE FINISHED PRODUCTS THROUGH FABRICATORS

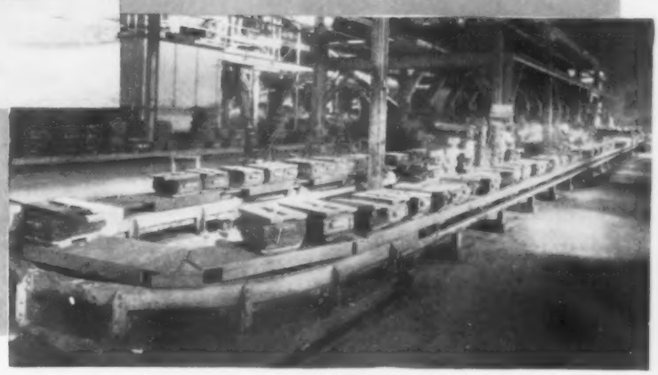
"NIROSTA" AND THE INTERLACED TRIANGLES ARE THE TRADE-MARKS FOR HIGH-CHROMIUM NICKEL STEEL ALLOYS PRODUCED UNDER PATENTS OF KRUPP NIROSTA COMPANY, INC.

3106

FOUNDRY EQUIPMENT
ENGINEERED
FOR THE MOST SEVERE FOUNDRY CONDITIONS



Meeting production schedules with certainty



AT the Chevrolet Motor Company Foundry in Saginaw, Michigan, Bartlett & Snow Mold Conveyors have been on the job month after month, year after year. Lost production time and expense for repairs have been negligible. Likewise many other foundries have learned that they can depend upon Bartlett & Snow Mold Conveyors to do their part in maintaining a stiff production schedule.

For into the design and development of this mold conveyor has gone all the experience and knowledge gained in the period of almost half a century in which Bartlett & Snow Engineers have helped to make foundry methods more efficient and foundry equipment better able to withstand the demands of foundry service.

Both in straight-away sections and at curves this mold conveyor performs as a continuous ribbon and no care need be taken in placing flasks in position.

The Bartlett & Snow Mold Conveyor runs on wheels to prevent destructive friction. It is fully protected against runouts and against abrasive damage from sand. Every detail is engineered for long life. Repairs can be made conveniently when continued use makes eventual replacement necessary.

To small foundries and large, Bartlett & Snow equipment brings new standards of efficiency that mean stabilized production methods, lower costs and higher profits. Write for a copy of Bulletin No. 63—"The Foundry Book" that will give you a new conception of the advantages of modernized foundry methods.

THE C. O. BARTLETT & SNOW COMPANY · 6202 Harvard Avenue · Cleveland, Ohio

FOR THE DOMINION OF CANADA
PEACOCK BROTHERS, LTD., MONTREAL

FOR GREAT BRITAIN
PNEULEC, LIMITED,
SMETHWICK, NEAR
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FOR CONTINENTAL EUROPE
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Acieries ci-devant
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BRISTOL'S

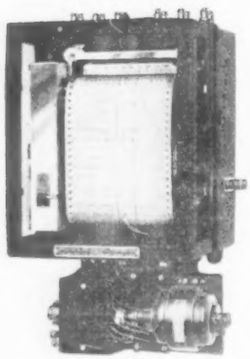
Automatic Temperature Control Equipment



Bristol's Pyrometer Controller. For ranges of temperature up to 3000° F.



Bristol's Motor Operated Controller Valve, for air only, gas only, also pre-mixed gas and air. Other types of Controller Valves furnished to suit installation requirements.



Strip Chart Type Multiple Recording Pyrometer; designed to provide unbroken records over periods of 45, 30 or 15 days. Faster speeds of chart travel can be furnished if desired.

can be furnished for use in connection with oil, gas or electrically heated furnaces, ovens, etc.—to operate within any selected control range up to 3000°F.

Developed primarily for control purposes Bristol's Equipment is sufficiently flexible in design to permit its use on virtually any control job encountered in ordinary heat-treating practice. This equipment is very easy to install and economical in operation. All parts are rugged and durable, thus assuring continuous accuracy and trouble-free operation, even after years of service.

For more complete information, or consultation concerning any control problem, get in touch with nearest Bristol's branch office, or write direct to main office. Complete Engineering Service is provided without obligation.

THE BRISTOL COMPANY
Waterbury, Conn.

BRANCH OFFICES:

Boston	San Francisco	Birmingham	Detroit
New York	Denver	Philadelphia	St. Louis
Pittsburgh	Chicago	Akron	Los Angeles

BRISTOL'S
SINCE 1889
Instruments *for* Indicating Recording Controlling

The Basic Needs of Industry

IRON ORE—Mined from the rich Marquette, Menominee and Mesaba Ranges of the Lake Superior Country, supplying all grades of ore required by blast furnaces for Bessemer, Malleable, Basic and Foundry Irons and Lump Ores for Open Hearth use.

PIG IRON—Made from all Lake Superior ores and furnished in all grades of Foundry, Malleable and Basic—marketed under trade name "Cleveland". Through arrangements with other producers all grades of Jackson County Silveries, Low Phosphorus and Bessemer Pig Irons are offered. Also "Superior" High Grade Charcoal Pig Iron.

TRANSPORTATION—Prominently identified with the development of modern lake transportation, the company owns and operates twenty-two vessels—Lake freighters with single trip capacity of 172,000 tons.

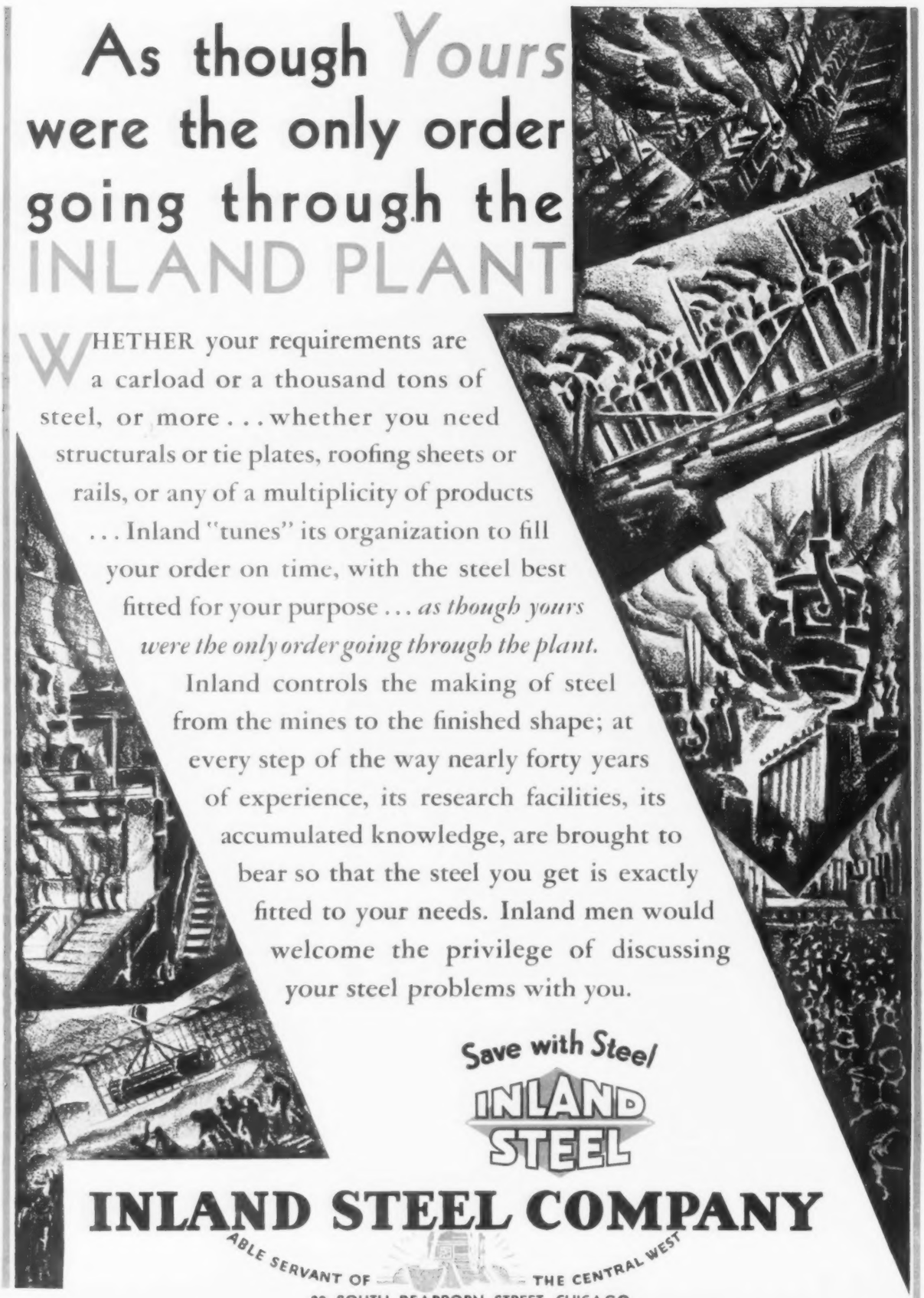
COAL—Mined from the seams of well known West Virginia fields, as well as from Kentucky and Ohio, for industrial, by-product, manufacturing and domestic uses. Graded and offered under the trade names Rock Lick Smokeless, Hot Spot, Gladiator, Corsair, Spartan, and Pittsburgh No. 8. By-Product Coke and Domestic Coke are also provided.

WOOD CHEMICALS—Vast holdings of Michigan hardwood forest acreage provide the wood chemical plants at Marquette with a supply of wood for distillation processes. Wood chemicals available for industrial uses include charcoal, wood alcohol, acetate of lime, acetic acid, acetone, formaldehyde, iron acetate, creosote oils, hardwood pitch and solvents.

LUMBER—From enormous forests in Michigan millions of feet of saw timber, chemical logs, mining timber, railroad ties, shingles and tie cuts, birch and maple logs for woodenware, cedar poles and posts, hemlock bark and pulpwood are supplied to industry. Cooperation is being given to the Government Reforestation plan now in progress on the Upper Peninsula of Michigan.

THE CLEVELAND-CLIFFS IRON CO.
CLEVELAND, OHIO

As though *Yours* were the only order going through the INLAND PLANT



WHETHER your requirements are a carload or a thousand tons of steel, or more . . . whether you need structurals or tie plates, roofing sheets or rails, or any of a multiplicity of products . . . Inland "tunes" its organization to fill your order on time, with the steel best fitted for your purpose . . . *as though yours were the only order going through the plant.*

Inland controls the making of steel from the mines to the finished shape; at every step of the way nearly forty years of experience, its research facilities, its accumulated knowledge, are brought to bear so that the steel you get is exactly fitted to your needs. Inland men would welcome the privilege of discussing your steel problems with you.

Save with Steel

INLAND STEEL

INLAND STEEL COMPANY

ABLE SERVANT OF THE CENTRAL WEST

38 SOUTH DEARBORN STREET, CHICAGO

Sheets Bars Bands Plates Structurals Rails Track Accessories Rivets Billets

UPSET FORGINGS ARE BETTER



NET WEIGHT 100 LBS.

BY NO OTHER METHOD COULD THIS FORGING BE PRODUCED

UPSET FROM A SOLID BAR—THE HOLE PIERCED CLEAN THRU—THE FORGING ADHERED VERY CLOSELY TO THE CONTOUR OF THE FINISHED PIECE—APPROXIMATELY ⅛" FOR FINISH ON ALL SURFACES AND THE SAVING OUR CUSTOMER MADE IN FREIGHT AND MACHINING TIME WAS TREMENDOUS.

OUR ENGINEERING DEPARTMENT IS AT YOUR SERVICE—THEIR ADVICE AND SUGGESTIONS HAVE SAVED THOUSANDS OF DOLLARS FOR VARIOUS MANUFACTURERS. SEND TODAY FOR OUR BOOKLET DESCRIBING **AMFORGE UPSET FORGINGS**—IT'S FREE.

AMERICAN FORGE CO.

2621 S. HOYNE AVENUE

CHICAGO

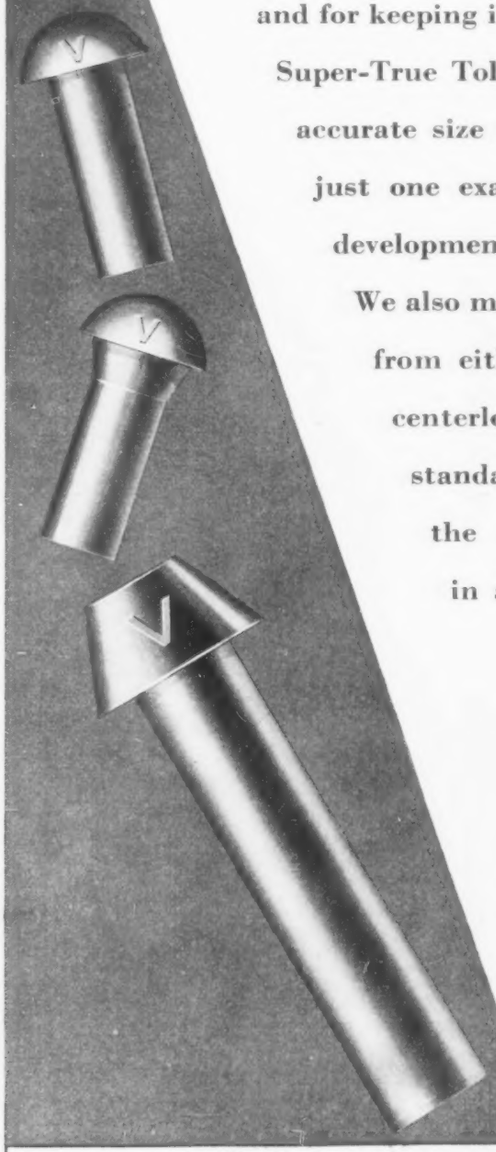
ALWAYS Safe to Specify "VICTOR"

Thirty-five years of untiring effort in producing quality rivets for the Boiler, Ship and Structural trade, have made VICTOR RIVETS known everywhere for quality and for keeping in step with progress. Our Victor Super-True Tolerance Rivets, made to extremely accurate size for high pressure drums, are just one example of being ready for new developments as they arise in industry.

We also make a full line of chain pins from either carbon or alloy steel—centerless ground—to meet all standard specifications, plus the added quality inherent in all VICTOR Products. . . .



Our Booklet "Scientific Facts" will be sent upon request

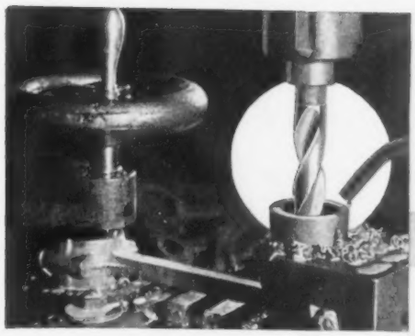




THE CHAMPION RIVET CO.

WESTERN PLANT **CLEVELAND, OHIO** EAST CHICAGO, IND.

Manufacturers of VICTOR BRAND BOILER *and* STRUCTURAL RIVETS — COUPLER *and* AIR BRAKE PINS



AND SO IT CAME TO A "SHOWDOWN" ON DRILLS . . .



All the cards were on the table—*face up*. An automotive manufacturer wanted to find the most economical drill to use on five of the most difficult jobs in the plant. Five leading makes of drills were tested on the basis of *cost per hole* drilled by each.

Conducted by the plant superintendent solely for his own guidance in purchasing drills, the test was impartial in every respect. Stock drills were run on the same press under automatic feed, and with one standard lubricant. Representatives of various drill manufacturers were present to watch the test and were permitted to offer suggestions

When the tests were completed, the average holes per grind were computed for each drill. The performance of the best drill, a Cle-Forge, was rated at 100%. Other drills were rated in comparative percentages to that of the best.

The results on the five jobs:

Cleveland CLE-FORGE High Speed Drills	96.7%
Drill—A	41.6%
Drill—B	66.4%
Drill—C	75.8%
Drill—D	66.7%

The Cle-Forge percentage was 29.9 points better than the average of all other drills—20.9 points better than the second best—55.1 points better than the poorest. On one press alone, the annual savings in drill cost effected by Cle-Forge Drills is $98.04 over the second best drill, and $176.70 over the poorest drill.

Many other conclusive figures were brought out in this test, ... figures which will interest every buyer of drills who would like to reduce drill costs. Copies of the detailed report will be mailed on request, together with complete forms for conducting a similar test in your own plant. There is no obligation of any kind. The coupon at the right is for your convenience.

THE CLEVELAND TWIST DRILL COMPANY
1249 E. 49TH ST. ∴ CLEVELAND

Send us a copy of Report No. 83 and "Cost-per-Hole" Test Forms. We're not obligated in any way.

Name _____

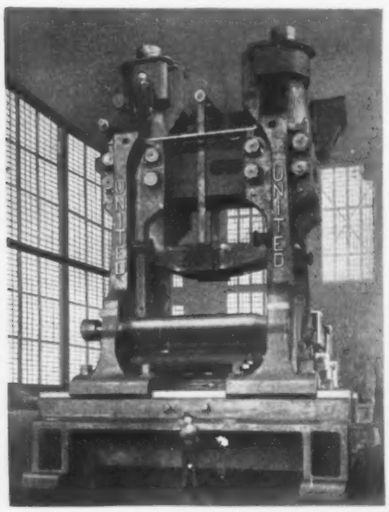
Company Name _____

Address _____

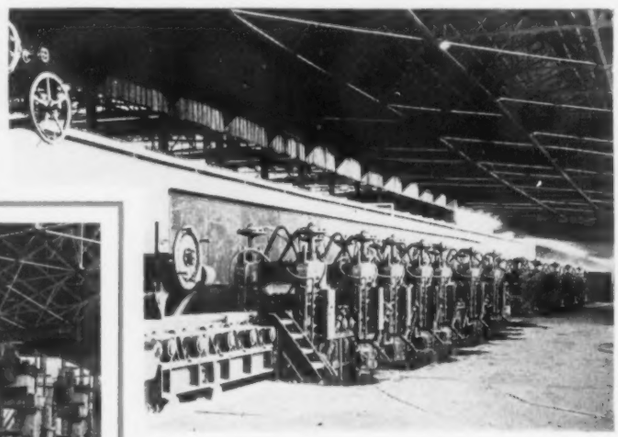


Copyright, 1930, by The Cleveland Twist Drill Co.

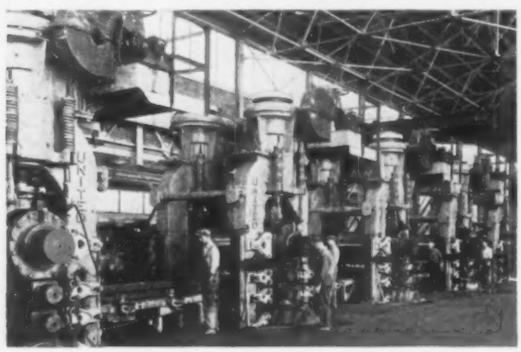
UNITED EQUIPMENT
ROLLING MILL



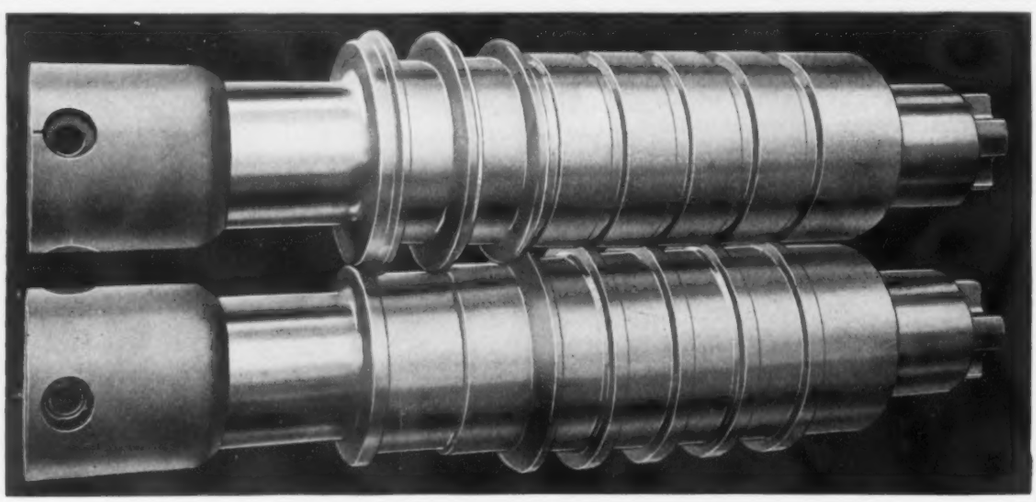
54″ UNITED
Blooming Mill



Continuous Merchant
Mill Installation



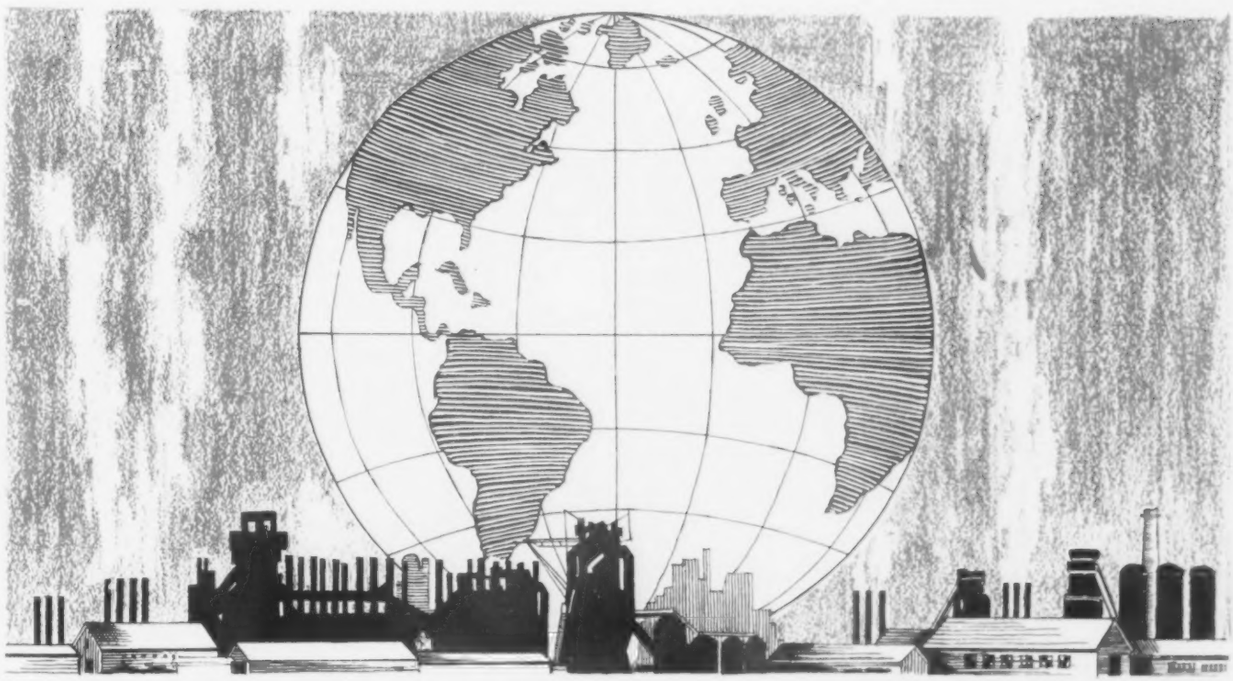
4-High Roller Bearing
Cold Mills



Pair of Unefco Green Wabbler Rolls

THE WORLD'S LARGEST MAKER OF

Serves the INDUSTRY *of the* WORLD



MILLS

BLOOMING · PLATE · UNIVERSAL
SHEET · STRUCTURAL · GUIDE
TIN · SKELP · HOT STRIP
COLD STRIP · MERCHANT · BILLET

ROLLS

UNEFCO HARD, MEDIUM and
MILD · STEEL · UNITED SPECIAL
STEEL · SAND · CHILLED
LINCOLN SPECIAL · ADAMITE

SHEARS

PLATE · BLOOM · ROTARY · VERTICAL
LEVER · HYDRAULIC · SQUARING
CROP · FLYING · FRONT END
DOUBLING · COLD STRIP · HOT STRIP

MISCELLANEOUS

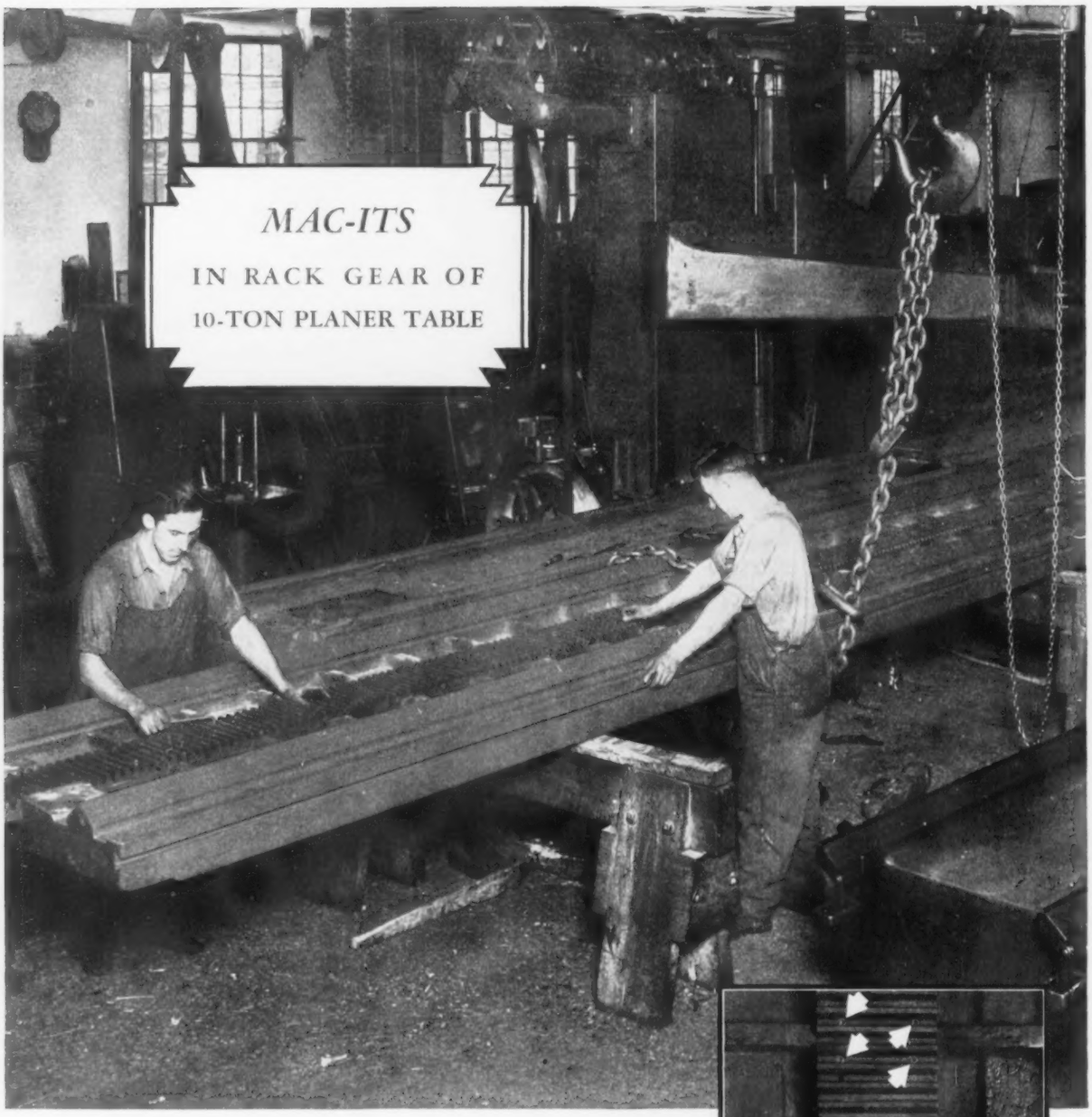
ROLL LATHES · SAWS · TABLES · MANIPULATORS · GEAR DRIVES · REELS · ANNEALING BOXES
HOT BEDS · STRAIGHTENERS · LEVELERS · FURNACE PUSHERS · CHARGERS · FORGING PRESSES · CASTINGS

UNITED

ENGINEERING *and* FOUNDRY COMPANY

PITTSBURGH — PENNSYLVANIA

ROLLS AND ROLLING MILL EQUIPMENT

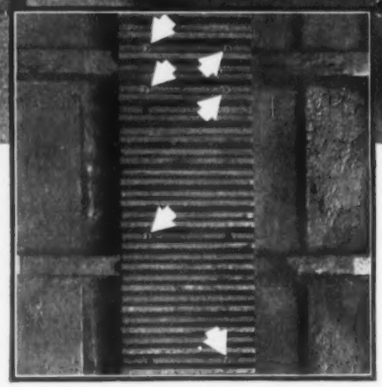


VISUALIZE for a moment the tremendous strains imposed on the screws and pins in the rack gear of this 10-ton planer table when it is in operation. MAC-IT Socket Head cap screws and the pins holding the rack gear to the table take the full driving force of a 30 h. p. motor.

This 20-foot planer table is for a 48″x48″ planer and the workmen are shown setting the rack gear in position with MAC-ITS.

In the close-up is shown the method of locating MAC-ITS with regard to machine design, an evidence of sound engineering on the part of The Cleveland Planer Company, the builders.

MAC-ITS are never bought because they are pretty to look at, but to make a good product better. For builders of machine tools and all other kinds of machinery where cap and set screw strength is important, a MAC-IT offers an extra margin of safety far beyond that expected. The Strong, Carlisle & Hammond Company, 1392 West Third Street, Cleveland, Ohio.

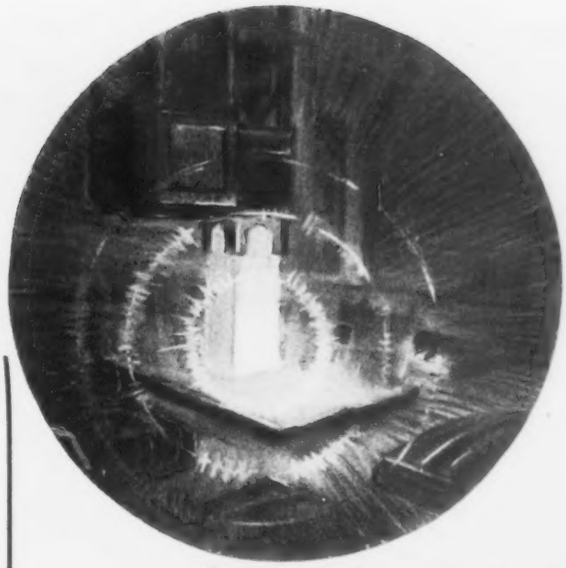


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STRONG, CARLISLE & HAMMOND

STOCKED BY DISTRIBUTORS IN MORE THAN 150 PRINCIPAL CITIES



WEIRTON

The inflexible standards established by its founders and rigidly maintained for a quarter of a century, have steadily increased the demand for Weirton products.

From an eight stand tin mill plant the capacity has been increased to 1,250,000 tons yearly in a wide range of semi-finished and finished products. Every ton produced must meet these same high standards—every process be under absolute control—every operation performed by highly skilled men, trained to uphold these standards of uniform quality—the watchword of the entire organization.

Ownership control of mines, including both iron ore and coal, combined with complete supervision of every manufacturing process to finished marketable product gives Weirton customers a constant and definite assurance of uniform and dependable quality.

Save with Steel and Specify WEIRTON PRODUCTS

Pig Iron—Open Hearth Steel—Billets—Slabs—Sheet Bars—Skelp—Angles—Beams and Channels—Round, Square and Flat Bars—Rails—Steel Plates—Tie Plates—Coke Tin Plate—Tin Mill Black Plate—Copper Bearing Terne Plate—Hot and Cold Rolled Strip Steel—Strip Steel Sheets—Long Terne Sheets—Galvanized, Black and Blue Annealed Sheets—Singled Pickled, Full Finished and Auto Body Sheets.

WEIRTON STEEL CO.

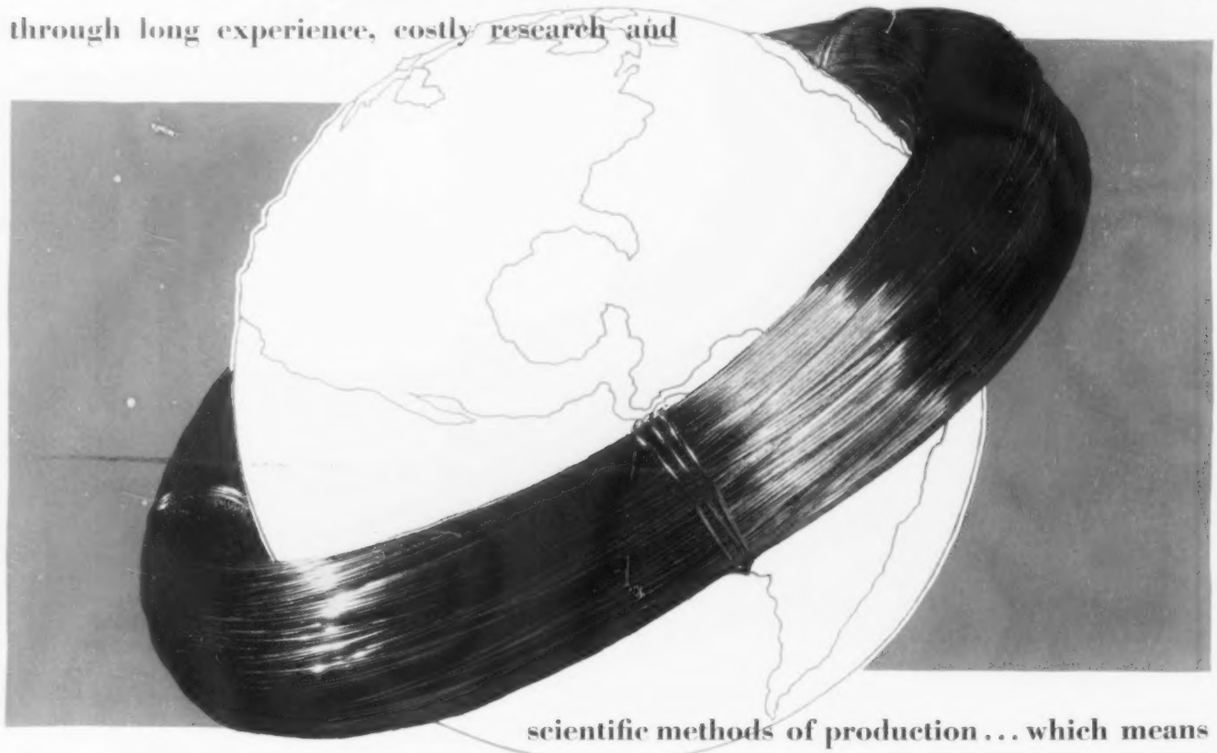
Division of National Steel Corporation

WEIRTON W. VA.

SALES OFFICES IN ALL PRINCIPAL CITIES

TAKE WIRE AWAY and WHAT HAVE YOU . . ?

Wire plays a dominant role in the drama of civilization. You find it everywhere. From kitchen utensils to elevator cables . . . from pianos to suspension bridges . . . from bed springs to power transmission lines . . . take Wire away, and what have you? We have attained the position as one of the world's largest wire specialists only through long experience, costly research and



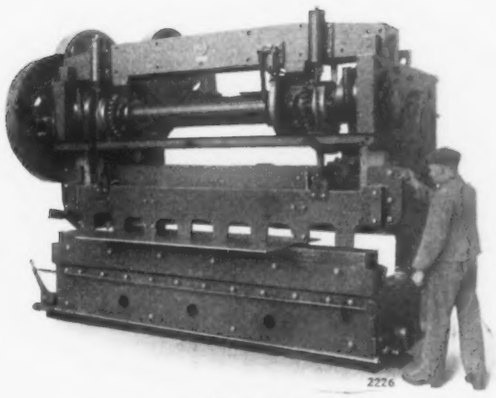
scientific methods of production . . . which means the manufacture of Uniform Wire. Whenever you see the Wickwire Spencer Wissco trade-mark, you will know that the Wire is as uniform as wire can be made . . . . every foot in a bundle, every bundle in a carload.

WICKWIRE SPENCER STEEL COMPANY, 41 East 42nd Street, New York City
Buffalo · Chicago · Detroit · Cleveland · Philadelphia · Tulsa · Worcester
Pacific Coast Headquarters: **San Francisco;** ***Branches and Warehouses:*** **Los Angeles · Portland · Seattle**

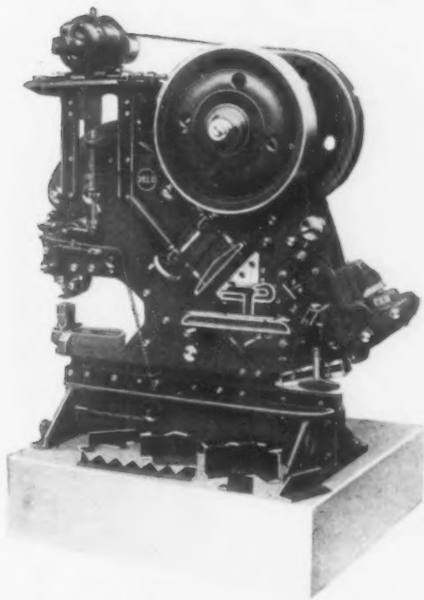
● ● ●

Wickwire Spencer manufactures High and Low Carbon Wires—in various grades and finishes—for your specific purpose . . . Hard Drawn and Oil Tempered Spring Wire, Armature Binding, Book Binding, Broom, Brush, Card, Clip, Flat and Strip Steel, Florist, Hairpin, Hook and Eye, Rope, Pin, Mattress, Music, Stapling, Shaped, Tire, Clock, Pinion, Valve Spring and Welding Wires. Consult the Wissco technical man on your wire problem, however large or small.

WISSCO
WICKWIRE SPENCER
WIRE

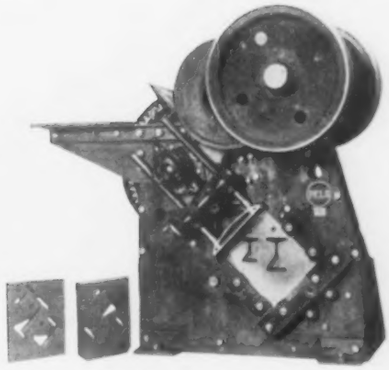


Gate Shear
Cross head backing upper knife slide across its full width increases rigidity



Combination Punch, Splitting Shear, Angle, Bar and Tee Cutter and Notcher or Coper

Punches
Plate Shears
Angle Shears
Bar Shears
Copers
Billet Shears



Angle and Bar Shear single end style. Cuts angles square and on bevel, also rounds, squares, flats and tees, without change of knives

PELS GUARANTEED UNBREAKABLE STEEL PLATE FRAMES

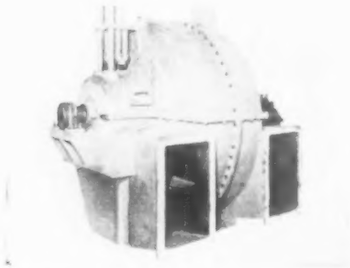
Gate Shears
Beam Shears
Scrap Shears
Benders
Heavy Presses

Henry Pels & Co.
INCORPORATED
90 West St. New York

FREYN DESIGN
Steel Mill Equipment



Stock-Line Recorder



Theisen Disintegrator



Chimney Valve



Electric Roll Heater

Blast Furnace
Skip Inclines
Beaton Tuyeres
Bell Hoists
Stock-line Recorders
Explosion Valves
Gas Cut-off Valves
Flue Dust Disposal Equipment
Blast Furnace Charging Control System
Leak Detector
Furnace Tapping Machine

Hot Blast Stoves
Stoves and Linings
Schiffer-Strack (S. S.) Checkers
Hot Blast Valves
Chimney Valves
Aspirating Gas Burners
Pressure Gas Burners

Gas Conditioning
Tower Washers
Theisen Disintegrator Gas Washer
Heat Exchangers

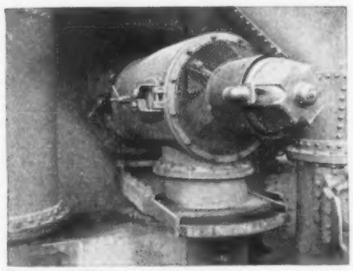
Stock House
Bins
Mechanical Bin Gates
Orr Roller Type Bin Gates
Blast Furnace Charging Control System

Sheet Mills
Electric Roll Heaters
Electric Regenerative Drag Roll

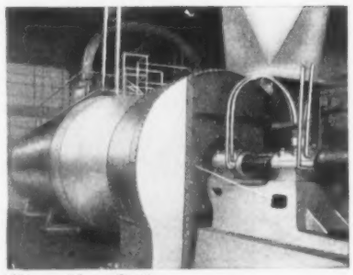
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Chimney Valves
Hot Blast Valves
Explosion Valves
Gas Cut-off Valves

Boilers
Waste Heat Boilers
Aspirating Gas Burners
Pressure Gas Burners

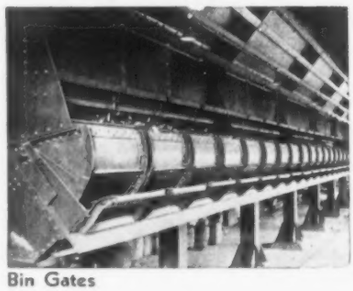
Furnaces
Siemens Heating Furnaces



Pressure Burner



Waste Heat Boiler



Bin Gates



Blast Furnace Charging Control

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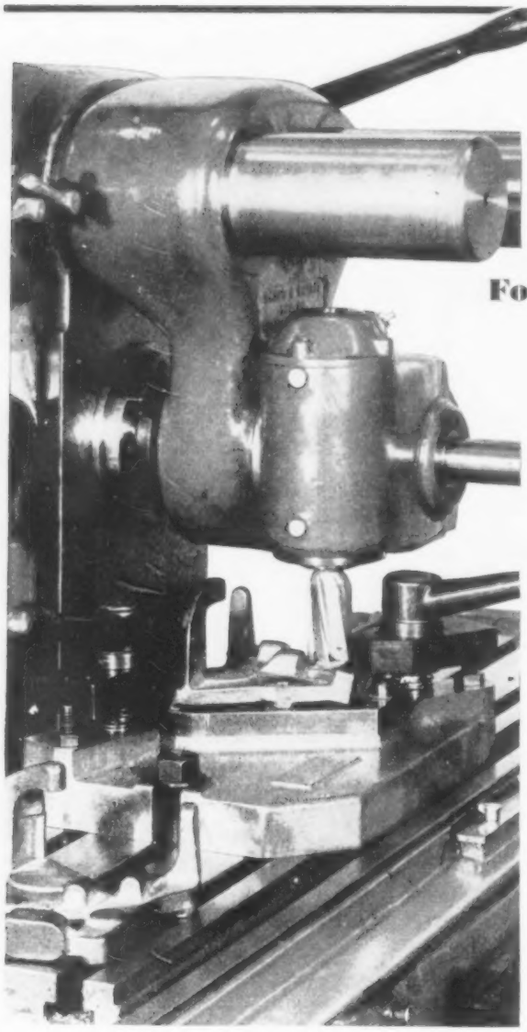
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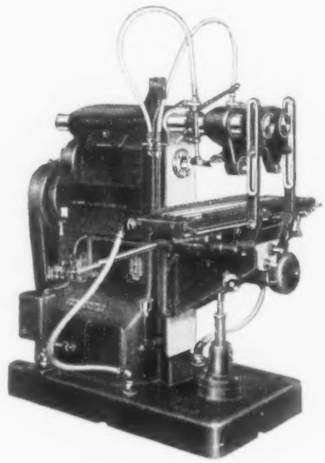
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THE IRON AGE

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MAY YOU HAVE A HAPPY AND PROSPEROUS NEW YEAR!

WE hope 1931 will be a year of prosperity for you. But as hoping has its limitations, we are going to help, too. The 53 issues of THE IRON AGE you will receive this year will be full of information you can use profitably.

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239 West 39th Street,
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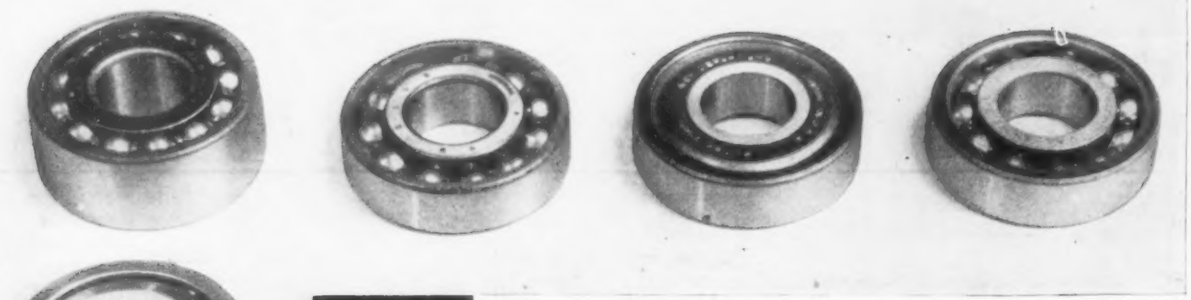
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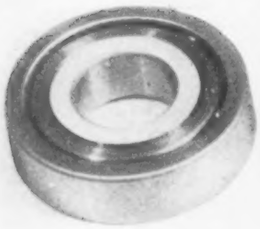
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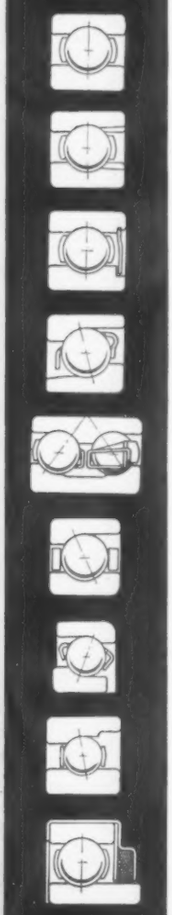












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NOTHING ROLLS LIKE A BALL

1656

THIS ISSUE IN BRIEF

January 1, 1931

An Institution

Such has been the first issue of THE IRON AGE every January. It is divided into several sections, each calculated to help supply the basis of a forecast more or less in terms of the record of the past.

* * *

High Lights of 1930

What has happened and why. A review that discusses the conditions of demand, production and prices and offers an exposition of the general economic situation.—Page 1.

* * *

Steel Taken by Industries

Survey for year just ended of the amounts of principal forms of steel taken by the major groups of users. The compilation is a monumental piece of work, possible only through the painstaking cooperation of the producers, who supplied not only the confidential figures of the tonnages shipped but a classification of them according to consumer interests. The tables are increasingly used in budgetary business control, in shaping sales policies and in recasting periodically through the year the changing outlook. —Page 7.

How Consuming Industries Fare

What's ahead as well as what's gone by in the automobile, building, railroad, agriculture, shipbuilding, machinery, aviation and other fields.—Page 12.

* * *

Technical Progress

Changes in process and method in steel and iron making and rolling, in casting, forging and welding, in hardening and inspection, etc.—Page 33.

* * *

What Does the Future Hold?

Dr. Haney gives a long as well as nearby forecast that is profoundly stirring (Page 56); Prof. Reed pays particular attention to the gold question (Page 60); Mr. Mills recounts what we are facing in upset Europe (Page 64); Mr. Eckel presents a thoughtful analysis of position of basic industries (Page 71).

* * *

Unemployment

Social legislation that will demand closest possible attention by industry is in the offing. Meanwhile steps have been taken and others are proposed to mitigate cyclical idleness.—Page 74.

* * *

Prepared for Declining Market

Some companies by holding prices in times of good demand find themselves in position to make reductions necessary to widen markets when times are dull.—Page 82.

* * *

Drive on Selling

Analysis indicates that price reductions have paralleled income reductions, so that buying power is not impaired but calls for special efforts to change buying attitude.—Page 78.

Rustless Steels

Decorative and corrosion-resisting steels find increasing uses in the face of the depression, with special promise shown in the food industries. —Page 84.

* * *

Added Steel Facilities

Steel-making capacity in 1930 was increased by 845,000 tons per annum (1.34 per cent), although consumption has been proceeding at a rate of 1,375,000 tons a year. Now under way is 4,180,000 tons.—Page 101.

* * *

Chronology

The high spots of the year, compiled in brief, make interesting reading and bring unusual reminders.—Page 90.

* * *

Facilities in Detail

Capacities in important forms of steel have been tabulated, company by company, arranged in geographical groups.—Page 94.

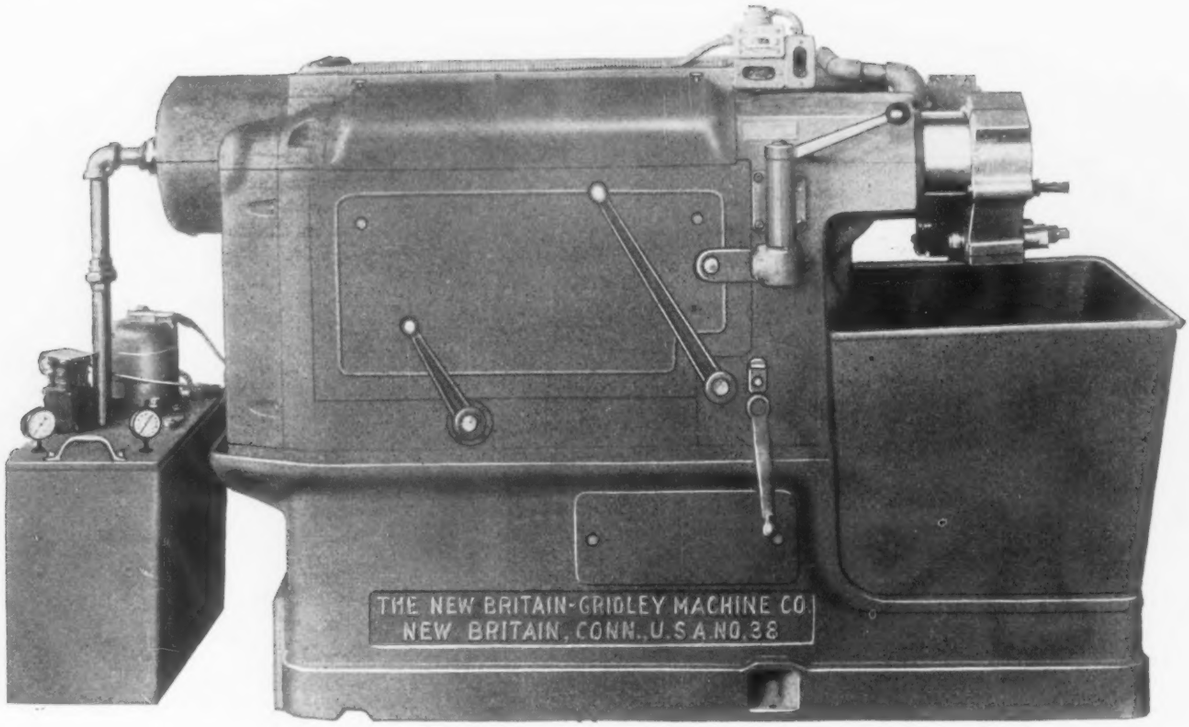
* * *

Production and Prices

This year some not easily obtainable production statistics have been added to those of prices.—Page 145.

NEXT WEEK

Crowded out were several notable articles, which will make Jan. 8 in part also a survey number. Included are a study of machine tools by Forrest E. Cardullo; reasons why several companies enjoyed relative prosperity last year, and analyses of such avenues of steel distribution as oil and gas lines, jobbing, etc.



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THE IRON AGE

New York, January 1, 1931

ESTABLISHED 1855 VOL. 127, No. 1

Iron and Steel Industry Passes Through a Year of Readjustment, with a Sharp Recession in Production and Prices

¶ After a short-lived spurt in the first quarter of 1930 steel production receded, totaling 40,000,000 tons for the year, or 27 per cent less than in 1929.

¶ Iron and steel prices underwent an uninterrupted decline, some forms of finished steel reaching the lowest levels since the war and pig iron falling to the lowest figures since 1915.

¶ THE IRON AGE composite price for finished steel dropped $5.82 a ton below its 1929 peak and struck the lowest point since May, 1922.

¶ Public works and public utilities gave the steel mills their greatest support, while the automobile industry, with a decline of 37½ per cent in production, took proportionately less steel than in recent years.

¶ Additions to open-hearth capacity totalled 845,000 tons, compared with 1,005,000 tons in 1929. Rapidly sinking earnings forced steel producers to retard their improvement programs.

ONE year ago the initial shock of the stock market crash had worn off and the iron and steel industry, although still concerned about the business outlook, had recovered much of its lost confidence. The widespread spirit of apprehension which had caused steel production in November, 1929, to undergo the sharpest decline since that of December, 1907, had disappeared, and calmer appraisal of the Wall Street debacle had restored faith in the sound position of the industry. It was emphasized that there had been no such piling up of inventories and kiting of prices as had occurred in iron and steel prior to the 1921 depression. No excessive accumulation of goods was seen anywhere, except possibly in the hands of the public, and likewise no important restriction of buying power was visible except among ultimate consumers.

Business reaction, it was believed, would be limited mainly to manufacturers of consumer goods, and a severe depression would be avoided through heavy capital expenditures by the railroads, utilities and other large corporations, and through the speeding up of public works.

Post-Panic Recovery Is Short-Lived

This view seemed to be borne out by the course of business early in the year. Much tonnage that had been held up after the stock market panic was released, and railroad specifications were heavy, in the middle of February accounting for 38 per cent of the leading interest's production. Steel ingot output in the first three months of 1930 was only 13 per cent smaller

than in 1929 and, with the exception of that year, 1928 and 1926, was the largest for any first quarter.

But from that time on there was a steady decline in output, interrupted only by an abortive recovery in August. From a peak of 86 per cent of capacity in February, production receded to a low of 35 per cent in December. Steel ingot output for the year, at 40,000,000 tons, was at a 63 per cent rate, estimating capacity in 1930 as averaging 63,500,000 tons. This compares with 87½ per cent for 1929, and is the lowest operation since 1921, a 37 per cent year, although only slightly under the 64 per cent rate of 1922.

Uninterrupted Fall in Prices

The protracted recession in business brought with it an uninterrupted fall in prices, and made it clear that the causes of depression were more far reaching than had been realized at the beginning of the year. Worldwide maladjustments came to light, among them maldistribution of monetary gold, a sharp decline in the price of silver and—perhaps most important—the collapse of raw material markets under the pressure of overproduction, brought about in many cases by artificial price restraints. As a consequence, the business outlook is now even more obscure than it seemed to be 12 months ago, and industry is no longer inclined to set a date for business recovery, although the length and the severity of the depression encourage the hope that the completion of necessary readjustments is not far away.

Iron and steel prices, though in no sense inflated prior to the stock market crash, have been steadily driven down since the first half of 1929. THE IRON AGE composite price for finished steel, at 2.121c. a lb., has reached the lowest level since May, 1922. The decline during 1930 was $4.82 a ton, and from the peak reached in 1929 was $5.82 a ton. While prices dropped more on some finished products than on others, only a few lines were unaffected, notably steel rails and alloy steel bars. Automobile body sheets declined $12 a ton during the year, and at the end of 1930 were $16 under their 1929 peak. Galvanized sheets and wire nails dropped $10 in 1930 and fell $14 and $15 a ton respectively from their 1929 highs. Cold-rolled strip underwent a recession of $8 a ton in 1930 and a decline of $12 from its 1929 peak.

Billets, slabs and sheet bars, after declining $2 during the last quarter of 1929, receded $4 more in 1930. Wire rods, after being reduced from $42 a ton to $40 late in the preceding year, were down to $35 a ton at the close of 1930. Bars, shapes and plates declined $6 a ton, after a recession of $1 late in 1929. Tin plate receded $5 a ton, after a reduction of $2 at the close of the preceding year.

Declines during 1930 among other steel products were as follows: cold-finished steel bars $4 a ton, hot-rolled strip $7, blue annealed sheets, $4, black sheets $8, plain wire $4, and pipe $4. Products that reached new low prices since the war include hot and cold-rolled strip, nails, automobile body sheets, and black, galvanized and blue annealed sheets. On the remainder of the lines 1930 prices did not fall to the levels reached during 1922.

Low Prices Encourage Some Forward Buying

THE IRON AGE composite price for pig iron declined from $18.21 a gross ton at the beginning of 1930 to $15.90 at the end. It is now at the lowest level since November, 1915, and is $2.81 a ton below the peak price of 1929.

Toward the end of 1930 there were indications that iron and steel prices had finally reached bottom. The American Radiator & Standard Sanitary Corporation showed its faith in pig iron prices by contracting for 75,000 tons. A considerable number of other large buyers placed contracts covering their pig iron requirements through the first quarter, and in some cases the first half of 1931. In the steel market producers of strips, sheets, bars, plates and shapes took a firmer price position and this action was followed by the announcement of an advance of $1 a ton on bars, plates and shapes to apply on first quarter business. A fair volume of contracting and specifying resulted from these moves.

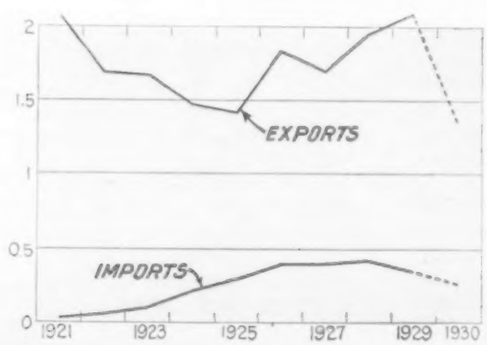
Scrap Fails as a Barometer

The scrap market failed as a barometer in 1930. Strong at the beginning of the year, it declined simultaneouly with the down turn of steel production early in March. Similarly scrap prices advanced in August when steel output increased, and continued to rise in September in anticipation of a seasonal gain in steel mill operations that failed to materialize. When it became apparent that the usual autumnal rise in steel output was not likely to occur, scrap prices eased off, and the downward trend continued through the remainder of the year.

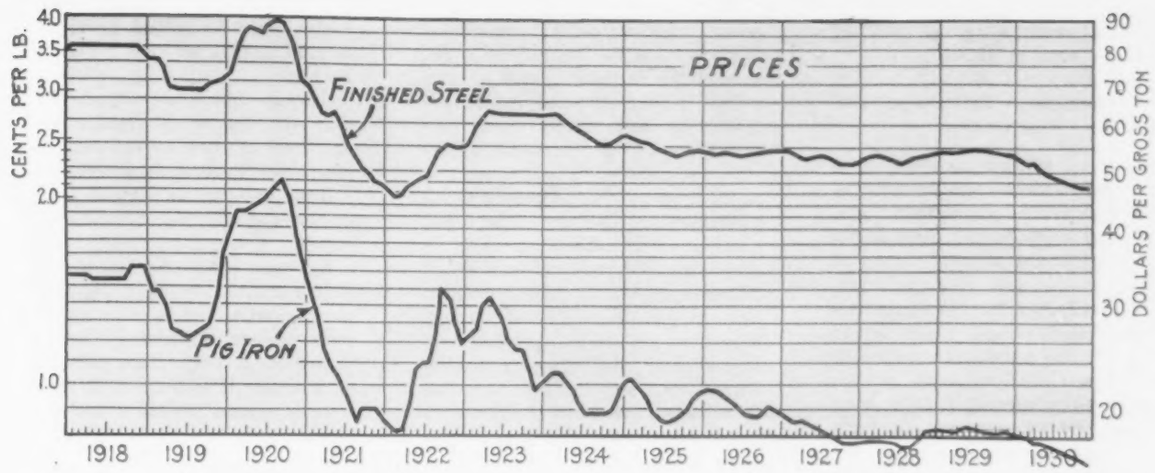
THE IRON AGE composite prices for heavy melting steel, representing an average of prices at Pittsburgh, Chicago and Philadelphia, was $11.25 a gross ton at the close of 1930. This figure was the lowest since July, 1921, and was $3.75 a ton lower than the peak of the year reached in February. The average for the entire year was $13.48, compared with $16.28 in 1929 and $14.29 in 1928. The high annual average of recent years was that for 1925, which was $17.12.

Automobile Output Declines 37 Per Cent

The expectation that industries making consumer goods would be more adversely affected than other outlets for iron and steel was borne out by events. Production of motor vehicles in the United States and Canada in 1930 was 3,505,000 units, the smallest output since 1922. The decline from the 1929 was 37½ per cent, as compared with a reduction of 27 per cent in steel ingot output. The middle classes, who were most severely hurt by stock market losses, either discontinued buying automobiles or purchased cheaper cars than formerly. As a consequence, the manufacturers of medium-



AMERICAN exports and imports of rolled and finished steel for ten years, 1930 having December estimated. The figures represent millions of gross tons.



FLUCTUATIONS Over Post-War Years in THE IRON AGE Composite Prices of Pig Iron and Finished Steel. The relative stability of finished steel prices continues to be demonstrated though the gap has been greater than in recent years. The highest finished steel composite figure during 1930 was 11.4 per cent above the lowest, compared with 2.1 per cent in 1929; in pig iron the divergence was 14.5 per cent, compared with 2.8 per cent. Since the peak early in 1923, both trends have been downward.

priced cars suffered more than the makers of low-priced and expensive automobiles. The Ford and Chevrolet companies together accounted for 64 per cent of the entire industry's production for the year.

As a consumer of steel the automobile industry fell to second position, after having been in first place for two years. THE IRON AGE analysis of steel distribution shows the automobile companies in 1930 took 15½ per cent of all the rolled steel made, as compared with 18 per cent in 1929 and 1928.

All generalizations are subject to exceptions and the tin can is one consumer product that did not suffer severely in 1930. Apparently the process of converting housewives into can-openers has not been completed and the food packing industry is still in the expansion stage. Containers took 6 per cent of the rolled steel produced, as against 5 per cent in 1929, and production of tin plate was only 8 per cent below the record total of the previous year.

Record Volume of Public Works

Public works and private capital expenditures gave the steel industry its most conspicuous support during the year. Although total construction expenditures in 1930 were nearly 25 per cent smaller than in 1929, building took first place among the outlets for steel, accounting for 19 per cent of the rolled steel produced against 16½ per cent in 1929.

There was a record volume of public works, and the outlook is for further heavy expenditures for public construction this year. A particularly sharp expansion is looked for in highway building. While expenditures for roads in 1930 reached a record total of $1,850,000,000, the outlay for the coming year is expected to approach $3,000,000,000. It is estimated that the program will provide work for 900,000 men for eight months or more. Since more than 50 per cent of the road building dollar goes to labor, the effect on consumer buying power will be far-reaching.

Public Utility Projects Large

Nineteen-thirty was also a record year in public utility projects. These accounted for 11½ per cent of the rolled steel produced, compared with 10½ per cent in 1929. Conspicuous among public utility undertakings was the construction of pipe lines. A vast new transportation system for gas, oil and gasoline is being built and will continue to take large quantities of steel for several years. Capacity for the electric welding of line pipe was increased sharply in 1930, with the addition of one mill at Pittsburgh and two at Youngstown to facilities already existing at Milwaukee. Seamless pipe also became a more important factor with the completion by the leading interest of three new mills for the manufacture of this type of casing. Most of the available lap-weld, seamless and electric-weld capacity of the steel industry was fully occupied from the beginning of June until late October, and a few orders had not been entirely executed at the year-end.

A Good Year Ahead in Line Pipe

Prospective business for 1931 looms large and active buying is expected to get under way earlier than it did last year to insure deliveries while weather conditions are still propitious for laying pipe. While line pipe for carrying natural gas and crude oil predominated among last year's awards, a new market appeared in the form of smaller diameter pipe for the transportation of gasoline from Oklahoma and Texas oil fields to the consuming markets in the Great Lakes States. One line of this type, sponsored by a number of large oil companies, took upward of 1400 miles of pipe, ranging from 8 in. down to less than 4 in. in diameter. Further construction of gasoline-carrying lines promises to be a feature of the pipe business this year.

Public utilities shared with public works and the railroads in sustaining demand for structural steel and reinforcing bars. Concrete bar capacity was well occupied during the second and third quarters of the year, but declined seasonally in the fall. The bookings of structural mills did a great deal to maintain a fair production rate in such districts as Pittsburgh, Chicago and eastern Pennsylvania, but fabricated steel awards, like reinforcing bar lettings, tapered off in the last quarter. Fabricated steel bookings for 1930 are estimated at less than 2,900,000 tons,

compared with a record total of 3,850,000 tons in 1929.

Sharp Decline in Rail Output and Car Orders

Railroad expenditures for general improvements, such as bridges, grade crossing elimination, stations and electrification were fairly high in 1930, but railroad buying of rolling stock and steel was adversely affected by the sharp decline in carloadings, which set in early in the year. The railroads took about 15 per cent of the rolled steel produced in 1930, compared with 17 per cent in 1929. Rail production fell 30 per cent below that of 1929, reflecting the failure of the carriers to specify fully against their last winter's purchases.

Freight car orders for domestic service numbered only 45,346 units, the smallest total since 1921 and comparing with 111,218 placed in 1929. However, considerable work was carried over from 1929 and the number of cars built in 1930 was 75,169, compared with 82,240 in the previous year.

Locomotive and passenger car business also declined. Only 440 locomotives were ordered, against 1212 in 1929, while the total number of passenger cars bought was 665, compared with 2303 in 1929. However, 972 locomotives and 1262 passenger cars were built, slightly in excess of the number completed in 1929 in each instance.

Prospects for equipment buying, at least the first quarter of 1931, are not encouraging, whereas the first quarter of 1930 was the best period of that year.

Railroad buying in general may be less in 1931 than the average of recent years, pending adjustments, legislative or otherwise, that will assure the economic future of the carriers. With a down trend in freight and passenger traffic entirely apart from the losses due to the business depression, the railroads are pressing for relief from rate reductions and for governmental action that will place them in a better position to meet the growing competition of waterways, motor transportation, oil and gas lines and air travel. Whether proposed consolidations will remedy the situation to the extent that some expect remains to be seen, but such mergers are being urged with more vigor than ever before.

Poor Earnings Force Steel Makers to Retrench

While all other industries do not have as serious problems confronting them as the railroads, business generally has been severely hurt by the depression and vanishing earnings have forced the downward revision of plans for capital expenditures. Among those forced to take in sail are the steel producers. It is probable that no more than two steel companies earned their common stock dividends in 1930, and that at least one failed to earn its preferred dividend. This poor showing was made in the face of marked success in developing new economies in manufacture. The Steel Corporation's earnings in the first nine months of 1930, the most active portion of the year, exceeded those of the first three quarters of 1927 and 1924, the last two recession years. This was accomplished, moreover, despite the fact that prices in the 1930 period, as measured by THE IRON AGE steel composite, were 6 per cent lower than in 1927 and 15 per cent lower than in 1924.

Savings in cost were made without reducing wage rates. With only one or two exceptions steel companies have maintained wages and the industry as a whole is still firmly opposed to cutting labor scales.

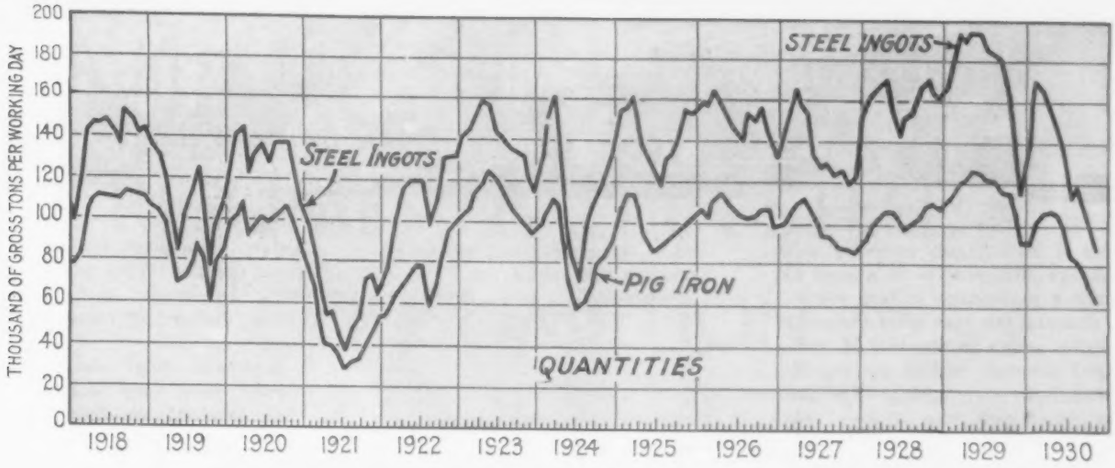
But steel producers, forced to retrench in other directions, have had no alternative but to slow up their improvement programs. At the beginning of 1930, plans called for an increase of 4,690,000 tons in the country's steel capacity, but additional capacity actually completed during the year totaled only 845,000 tons. This gain, however, ranks fifth among post-war increases, having been exceeded by those of 1929, 1928, 1926 and 1923.

Sharp Reduction of Pig Iron Melt

Pig iron production in 1930 is estimated at 31,600,000 tons, the smallest total since 1924 and comparing with the record figure of 42,613,983 tons reached in 1929. Pig iron, like steel, showed a recovery in output early in the year, but pig iron production reached its peak in April, whereas the highest rate of ingot output was attained in February. From April to December there was a continuous decline in production. On Dec. 1 there were only 107 furnaces in blast, or 78 fewer than on April 1.

Pig iron consumption was adversely affected by reduced activity of the motor car industry, the cast iron pipe foundries, the heating and sanitary equipment manufacturers, and other important melters. The heating equipment and sanitary ware industry suffered because of the low rate of residential construction. Output of cast iron gas and water pipe in 1930 dropped to about 1,000,000 net tons, compared with 1,238,177 tons in 1929 and 1,315,198 tons in 1928. The peak year for cast pipe production was 1926, with a total of 1,534,278 tons.

The decline in cast pipe output accentuated the competitive pressure of Alabama iron in Northern markets. The Alabama furnace price for outside delivery dropped below $10 a ton on at least one large transaction late in the year and was never above the low levels reached in the previous year. In the North, the Valley market displayed the greatest stability. For a time during September and October not a single merchant stack was in blast in the Valleys or western Pennsylvania, an unprece-



Fluctuations in Daily Average Production of Steel Ingots and of Pig Iron During the Past Twelve Years. While generally parallel, the curves are farther apart than formerly, much farther than in 1921, for instance. They are based on monthly ingot figures of the American Iron and Steel Institute and monthly pig iron figures gathered by The Iron Age.

dented occurrence. Thus stocks in that district were prevented from accumulating, in contrast with the large stocks that were piled up at other producing centers.

Water Shipments Recede

Water shipments of ore, pig iron and steel were, in general, smaller in 1930 than in 1929, in keeping with the decline in business. The water movement of Lake Superior ore in 1930 was 46,582,982 tons, the smallest total since 1924 and a decrease of 28½ per cent from the 1929 figure. The all-rail movement is estimated at 650,000 tons.

Shipments of iron and steel on the Ohio River in 1930 amounted to approximately 1,150,000 net tons, compared with 1,212,912 tons in 1929. On the Monongahela 1930 shipments were 1,250,000 tons, against 1,203,727 tons in the previous year. The Allegheny River movement was 50,000 tons as compared with 2507 tons in 1929.

The movement of finished steel from Lake Erie ports to Chicago in 1930 was 65 to 70 per cent of the 1929 total. Chicago mills shipped a substantial volume of skelp by boat to Milwaukee, for use in the pipe plant of the A. O. Smith Corporation. They also made Lake shipments of steel, principally alloy steel, to Detroit, although the amount was unquestionably lower than in 1929, because of the reduced activity of the automobile industry.

About 35,000 tons of pig iron was shipped from Lake Erie ports to Chicago and Milwaukee in 1930, as compared with 46,000 tons in 1929. Chicago furnaces moved about 6000 tons by water to Muskegon, Mich., in both years. A Buffalo furnace moved 9000 tons of silvery to Chicago by boat in 1930, and two cargoes of spiegleisen, about 4000 tons, were shipped to Chicago by a Canadian furnace. A New York State producer of low phosphorus pig iron moved a cargo of 2000 tons to Chicago. In 1929 Chicago received water shipments of 2000 tons of low phosphorus and 2000 tons of spiegeleisen, both of which came from England.

Pig Iron Production Drops from High Record

AFTER making a new high record in 1929, pig iron production in 1930 has fallen off approximately 25 per cent. Now estimated at 31,600,000 tons, this represents the eleventh largest year we have had. It has been exceeded by every year since 1915, with the exception of 1919, 1921, 1922 and 1924.

Furnaces in blast were reduced from 177 on Dec. 1, 1929, to 107 on Dec. 1, 1930. The operating rate went down meantime from 98,450 tons a day to 60,205 tons; through the spring, however, a considerably higher rate was held, at 104,770 tons a day on May 1, with 183 furnaces in blast at that time.

Changing Activity of Blast Furnaces

1930	Number in Blast	Daily Rate, Gross Tons
Jan. 1	157	88,250
Feb. 1	172	96,370
March 1	179	102,250
April 1	185	106,080
May 1	183	104,770
June 1	180	103,425
July 1	160	92,590
Aug. 1	144	83,645
Sept. 1	139	80,620
Oct. 1	123	73,525
Nov. 1	111	65,965
Dec. 1	107	60,205

The movement referred to several times in the past toward larger and larger tonnages from each furnace in operation has continued through the past year. Thus, the 107 furnaces blowing on Dec. 1 were running at the average rate of 560 tons a day, against 460 tons a day, as recently as 1926.

Furnaces in blast at the beginning of each month in 1930, with the current operating rates, are shown in the accompanying table.

Heavy Reduction in Steel Output

STEEL production last year, as shown in the upper curve on the diagram, dropped off sharply from the unprecedented total of 1929. As we go to press, it is estimated that the aggregate amount, including electric steel, was 40,000,000 tons of ingots and 1,100,000 tons of steel castings. This puts the year in the eleventh position, in magnitude of production of steel. It has been exceeded by every year since 1915, with the exceptions of 1919, 1921, 1922 and 1924.

A year ago, and two years ago, attention was called to the exceptional gap between output of pig iron and output of ingots. This had exceeded 12,000,000 tons in each of those years, against a maximum of 7,500,000 tons in preceding years. This year the gap has closed somewhat, being estimated now at about 8,400,000 tons. Scrap has continued to be used on a large scale in steel making, and the ex-



cess of steel ingots over pig iron tonnage this year is in almost as large a percentage as last year.

Starting the year after the stock market crash in the fall of 1929, ingot tonnage picked up rapidly through the early spring. The output of March was 45 per cent greater than that of the preceding December. Thereafter, however, a decline set in, interrupted only briefly in August, until, as the year goes out, December has a probable total tonnage less than one-half that of last March.

In the following table is given the production of ingots, month by month, on the daily basis, according to calculations of the American Iron and Steel Institute. These are based upon reports of open-hearth and Bessemer steel output by companies which made about 94¼ per cent of the total ingots in 1929. Crucible and electric steel ingots, which amounted to about 1 per cent of the grand total, are not included in this tabulation.

Months, 1930	Daily Ingot Production, Gross Tons	Months, 1930	Daily Ingot Production, Gross Tons
Jan.	140,596	July	112,823
Feb.	169,930	Aug.	119,050
March ..	165,381	Sept. ...	110,307
April ...	159,764	Oct.	100,756
May	149,066	Nov.	89,379
June ...	137,610	Dec.	.....

Outputs of steel ingots and pig iron are given below for 1930 and the preceding 12 years:

	Pig Iron, Gross Tons	Steel Ingots, Gross Tons	Steel Ingots and Castings, Gross Tons
1918	39,054,644	43,051,022	44,462,432
1919	31,015,364	33,694,795	34,671,232
1920	36,925,987	40,881,392	42,132,934
1921	16,688,126	19,224,084	19,783,797
1922	27,219,904	34,568,418	35,602,926
1923	40,361,146	43,485,665	44,943,696
1924	31,405,790	36,811,157	37,931,939
1925	36,700,566	44,140,738	45,393,524
1926	39,372,729	46,936,205	48,293,763
1927	36,565,645	43,776,717	44,935,185
1928	38,155,714	50,325,393	51,544,180
1929	42,613,983	54,850,433	56,433,472
1930 (Est.)	31,600,000	40,000,000	41,100,000

Both Exports and Imports Shrink Heavily

UPSETTING the tendency of the past five years, in which exports of iron and steel products from the United States showed an almost uninterrupted increase, culminating in shipments of more than 3,000,000 tons in 1929, the year just past has recorded a sharp shrinkage. The total for 11 months is reported at 1,883,037 tons, and the estimate for the full year is a round 2,000,000 tons.

The drop from 1929 is approximately one-third and this drop has been participated in with fair regularity all along the list. Rolled and finished steel exported in the first 11 months was almost precisely two-thirds that of the corresponding part of 1929. The same is true of the scrap exports, which made the largest total single item in the entire list. Semi-finished steel shipments held up better, through heavy outflow of wire rods and skelp.

Other items which showed less reduction than the average included tin plate, which, for the year, is estimated at 230,000 tons, against an average of about 250,000 tons for the past three or four years. Fabricated structural material declined only 9 per cent from 1929, but plates and structural shapes dropped off more than one-half.

Iron and steel plates shipped abroad were only slightly more than one-half the 1930 tonnage, while steel bars were less than one-half as much as the preceding year. Casing and oil-line pipe dropped off almost one-half. So did the largest items of wire and wire products. Steel castings, on the other hand, lost only 13 per cent, compared with 1929.

Imports of iron and steel, now estimated at 515,000 tons, the lowest since 1921, showed a shrinkage of about 30 per cent from the total of 739,004 tons in 1929. This drop was particularly heavy in the item of scrap, which fell off about 70 per cent. Pig iron, on the other hand, lost only 6 or 7 per cent from the preceding year. Steel bars of various types actually recorded an increase of 12 per cent. Pipe, however, dropped to about half, as did hoops and bands. Cast iron pipe and fittings declined to less than one-fifth the 1929 tonnage.

Imports of manganese ore in 11 months were 252,587 gross tons, compared with 308,633 tons in the corresponding period of 1929. Imports of iron ore dropped from the 1929 record-breaking total by almost 10 per cent, the total incoming shipments for 11 months having been 2,598,204 tons.

Machinery exports held up to their enormous tonnages of 1929 through the first five months of 1930, since when they have shown the same sort of sharp shrinkage which has characterized the movement of iron and steel items. But the 10-month total, at $450,991,000, was the greatest for that period—except for 1929—that we have ever known. With the further exception of 1928 and 1920, it has exceeded the entire 12-month shipments of every preceding year.

Agricultural implements have bulked large in the year's shipments of machinery, as they did in 1929 and 1928. A 10-month total of $100,693,000 was recorded in 1930, being about 22 per cent of the total, compared with 23½ per cent in 1929.

UNITED STATES EXPORTS OF IRON AND STEEL
(Gross Tons)

	1925	1926	1927	1928	1929	1930
Jan.	141,777	174,585	215,235	205,766	274,296	225,090
Feb.	102,299	157,187	166,129	185,915	259,711	197,426
Mar.	155,384	169,438	171,094	221,935	270,925	238,333
Apr.	155,375	194,449	192,339	215,184	277,580	208,639
May	150,612	173,418	202,708	267,890	261,516	196,120
June	136,847	159,506	184,364	262,052	247,811	159,392
July	139,861	194,717	190,502	253,336	270,532	131,772
Aug.	188,465	171,588	175,636	287,297	242,856	151,235
Sept.	136,791	182,071	166,352	228,056	222,408	131,211
Oct.	141,817	172,070	170,255	256,870	247,646	131,850
Nov.	171,134	219,830	177,928	256,886	241,829	111,968
Dec.	142,209	198,189	168,427	221,810	215,242	.....
	1,762,571	2,167,048	2,180,969	2,862,997	3,032,352	*2,000,000

*Estimated, as to December.

BUILDING CONSTRUCTION RESUMES LEAD IN STEEL CONSUMPTION

AFTER a lapse of two years, building and construction again took the lead in 1930 as the largest consumer of steel mill products—a position held by the construction industry in 1927. The automotive industry, which was first both in 1929 and the year before, falls to second position, while railroads, which were second a year ago, and third in 1928, hold the third place.

Production is estimated at 29,600,000 gross tons of rolled steel, a decline of 26.8 per cent from the preceding year. Last year's estimate of 40,333,000 tons checked very closely with the final figures of the American Iron and Steel Institute, at 40,594,367 tons.

Estimates of production of rolled steel are based upon returns from 57 steel makers, accounting for a total of 28,730,000 gross tons, or about 96 per cent of the estimated total for the industry. Declines in production from the preceding year were in varying percentages among these producing companies, but two or three companies, in particularly fortunate positions, showed an actual gain, in spite of the general decline of more than one-quarter for the industry as a whole.

It was possible to distribute among the various consuming channels by far the greater portion of the steel tonnage reported as produced and shipped during the year, which gives us the table at the bottom of pages 10 and 11, in which this story is told in detail on the tonnage basis. About 91 per cent is there distributed among the various consuming channels, the remaining 9 per cent being carried under miscellaneous.

For preparing the diagram on page 10 the tonnages allotted to a number of the consuming channels shown on the same page were allocated to the final consumers by the use of a schedule of percentages, made up by THE IRON AGE, to cover the intermediate channels of distribution, such as jobbers, boiler and tank manufacturers, bolt, nut and rivet makers, and the like.

Building Steel Has a Large Lead

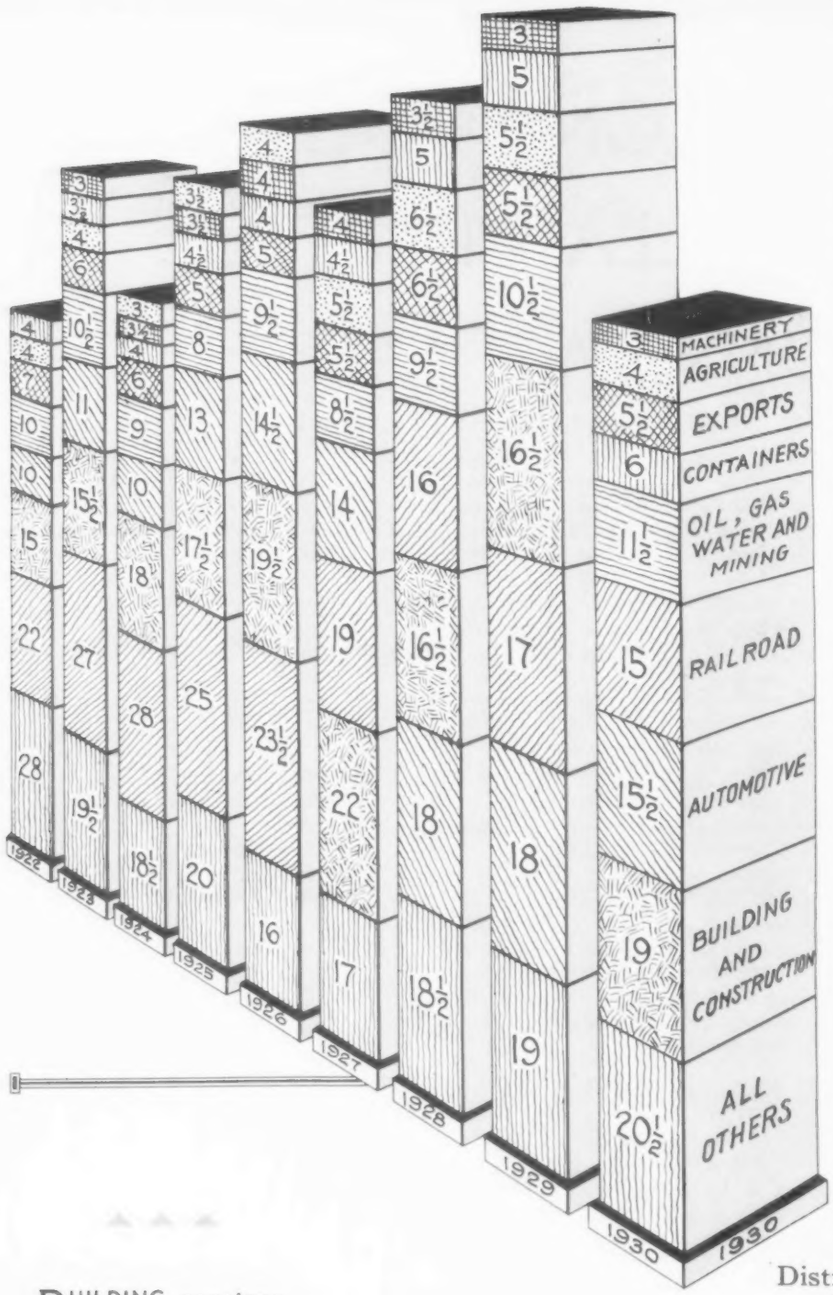
ANALYSIS of all the returns indicates that the amount of steel going into building construction is about 19 per cent of the total of all the steel made during the year. This is the largest proportion taken by any industry since 1927, and the figure would be still higher if the building and bridge steel allocated to the railroads were to be included here. The total amount apparently going into building construction is about 5,600,000 gross tons. This construction group took approximately 60 per cent of all of the structural shapes, 20 per cent of the bars and plates, 17 per cent of the sheets, 22 per cent of the wire, 13 per cent of the pipe, and 10 per cent of the strip steel.

In second position, the automotive industry, with 15½ per cent, accounts for approximately 4,600,000 gross tons of rolled steel. This industry took 57 per cent of the strip steel made, more than 30 per cent of the bars and about 26 per cent of the steel sheets. The sharp drop from the 18 per cent of a much larger tonnage allotted to the automotive industry a year earlier was accounted for partly by the heavy diminution in number of automobiles made and, in smaller measure, by the fact that the shrinkage in total number of units was greater in the heavier cars than in the lighter models.

Steel Taken by Leading Consuming Industries in 1930

(Percentages of Principal Forms)

	Bars	Shapes	Plates	Sheets	Tin Plate	Strips	Pipe	Wire
Construction	19.9	59.7	20.7	17.2	1.2	10.1	13.3	21.8
Automotive	30.5	0.5	4.7	25.8	....	57.0	0.5	6.3
Railroads	10.1	16.4	20.6	2.9	....	1.2	3.3	1.9
Oil, Gas, Water	2.1	2.0	18.0	3.1	1.5	....	60.5	1.5
Mining, Lumbering	1.9	2.0	2.4	1.4	0.2	....	2.0	3.6
Agriculture	5.4	0.7	1.1	4.6	0.2	1.2	7.9	17.8
Metal Containers	0.5	0.6	1.6	6.5	74.9	1.2	0.3	0.7
Shipbuilding	1.2	2.2	6.0	0.2	....	....	0.8	0.4
Machinery	6.3	3.6	5.7	0.8	0.1	1.2	1.2	2.3
Exports	2.3	5.2	4.6	5.5	15.7	....	3.9	5.2
All Other	19.8	7.1	14.6	32.0	6.2	28.1	6.3	38.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0



Railroad takings, which held first position from 1922 to 1926 inclusive, and in early years were much more dominant than has been the case in the past decade, were about 15 per cent. This represents some 4,450,000 tons. The railroads were practically tied with the construction industry as leader in consumption of steel plates, with between 20 and 21 per cent of the total plate production. They stood second to the construction industry in shapes, taking about 16½ per cent, and took 10 per cent of the bars, against much larger quantities by both the leading consuming channels.

These three big users of steel absorbed just under 50 per cent of the total output—the first time since 1922 that they have been below the half-way mark. In 1929 they took about 51½ per cent and in 1928, 50½ per cent. Looking further backward, they took 55 per cent in 1927, 57½ per cent in 1926, 55½ per cent in 1925, 56 per cent in 1924, 53½ per cent in 1923.

What the Smaller Outlets Absorbed

COMBINING the oil, gas, water, mining and lumber companies, a total of about 11½ per cent is indicated, which represents 3,400,000 gross tons of rolled steel. Agriculture, whose takings are made up largely of machinery and other implements, required 4 per cent, representing approximately 1,200,000 tons. Exports took approximately 1,550,000 tons, or a little under 5½ per cent of the total. Containers, principally in the form of tin cans and of steel barrels and other carrying units, took approximately 6 per cent, and

BUILDING construction showed less of a decline in 1930, in point of steel consumption, than did most of the other activities through which steel is put into the use of man. Hence it assumed first position, as in 1927, taking almost one-fifth of all the steel made during the year. Automobiles, dropping to second place, kept only slightly ahead of the railroads.

Distribution of Rolled Steel in 57 Companies Producing 96

Amount of Each Form Taken, in Thousands

	Heavy Rails	Light Rails	Track Accessories	Structural Plates	Structural Shapes	Bars	Hoops, Bands, Cotton Ties
Railroads (cars and locomotives)	....	....	0.1	529.3	209.3	351.7	14.1
Railroads (bldgs. and bridges)	0.6	....	0.1	72.4	297.1	80.7	1.9
Railroads (track work)	1,571.4	2.3	626.0	6.4	0.4	50.8	0.1
Fabricators and bldg. contractors	2.7	0.1	0.2	535.9	1,762.5	393.6	13.6
Bldg. hardware and trim companies	....	....	....	4.0	25.5	88.9	28.2
Auto. and part mfrs.	0.1	....	....	143.0	15.5	1,469.5	282.5
Oil, gas and water companies	0.1	3.9	0.6	478.0	22.7	39.7	5.5
Mining and lumber companies	59.5	5.6	15.5	14.5	9.0	13.3	2.0
Agri. mfrs. and distributers	0.6	....	0.1	25.3	12.4	200.7	58.8
Container makers	....	....	....	7.6	1.3	3.1	41.1
Shipbuilding	0.4	....	....	171.0	63.4	18.6	0.7
Boiler and tank mfrs.	....	....	....	441.2	48.2	26.6	2.7
Machinery and tool makers	2.0	....	0.2	90.1	66.4	247.2	8.3
Bolt, nut and rivet makers	....	....	....	0.3	0.2	345.4	2.8
Electrical mfrs.	0.3	....	....	51.7	11.1	35.1	10.7
Concrete reinforcing companies	....	....	....	0.3	2.6	426.9	0.5
Forgers	1.1	....	0.1	8.3	....	171.3	0.6
Pressed and formed metal mfrs.	....	....	....	12.0	0.6	6.0	13.1
Furniture and stove makers	....	....	....	0.7	1.6	52.1	9.3
Jobbers and warehouses	3.1	2.5	13.2	152.3	299.7	446.6	27.0
Exports	100.8	0.1	11.6	137.8	165.2	108.8	9.8
Miscellaneous	26.0	0.8	9.5	141.9	149.6	463.1	31.9
Totals reported	1768.7	15.3	677.2	3,024.0	3,164.3	5,039.7	565.2
Total year's production	**1,770**	**80**	....	**3,200**	**3,200**	**5,900**	....

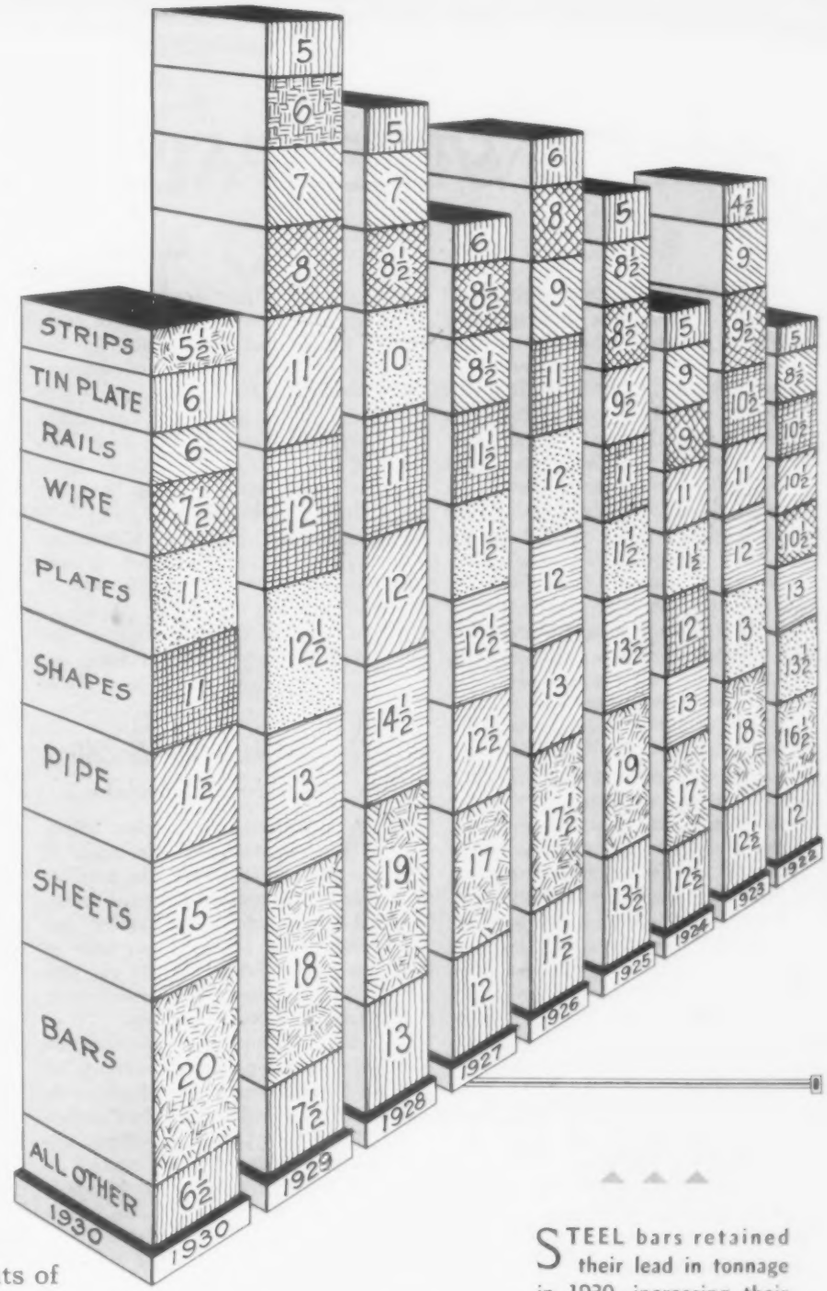
machinery absorbed something like 3 per cent, as in the preceding year.

Miscellaneous industries, not included in the above, called for about 20½ per cent of the total, compared with 19 per cent in 1929 and 18½ per cent in 1928. These include, among other things, shipbuilding, rated at about 1⅓ per cent of the total, electrical manufacturers, nearly 2 per cent, furniture and stoves, 2 per cent, and pressed and formed steel products, 1½ per cent.

Reports on exports check very closely with the returns of the United States Department of Commerce for the first 11 months of the year. Canada was by far our largest customer, with Japan in second position.

It was not to be expected that new tonnage records would be made by any of the various forms of steel in such a year of depression as has just closed. It may be of interest, however, to indicate that tin plate held up much better to its previous record-breaking performance than any of the other lines. On the basis of returns from identical companies in the two years, 1929 and 1930, the shrinkage in total tin plate output was about 8 per cent.

Other commodities did not fare so well. Steel sheets were down 33 per cent, due in large measure to the drop in automobile production. Rails were down 30 per cent; steel plates and bars, about 27 per cent each; shapes and steel strip, approximately 23 per cent each; and wire, about 17 per cent. Pipe was more active than some of these other forms of steel, having shown a drop of only 13½ per cent from 1929.



1930, According to Shipments of Per Cent of the Year's Output

of Gross Tons, by Different Industries

Black Plate for Tinning	All Other Black Plate and Sheets	Tubes and Pipe	Wire Products	Strip Steel	All Other Finished	Billets and Slabs	Sheet and Tin Bars	Wire Rods	Skelp	Totals
....	93.5	27.8	7.6	15.1	171.2	71.1	....	....	....	1,490.8
....	4.3	0.8	7.2	....	2.0	....	5.1	17.5	....	489.7
....	4.1	0.6	17.6	0.8	18.3	6.0	....	....	....	2,304.8
....	187.4	62.1	66.7	72.1	30.2	11.1	16.9	104.7	7.6	3,267.3
0.3	241.0	2.0	63.3	53.0	11.0	0.2	....	0.6	....	518.1
0.1	990.3	5.4	97.0	829.6	61.7	219.3	218.7	36.3	44.6	4,413.6
23.5	91.1	1,542.7	23.9	0.1	24.7	27.1	....	0.8	13.7	2,298.1
....	13.0	5.2	12.8	0.3	7.4	0.2	....	....	....	158.3
....	143.1	2.7	305.3	13.9	9.9	37.0	....	129.4	....	939.2
1,265.2	189.4	0.4	11.4	11.3	65.9	5.3	55.7	13.4	....	1,671.1
....	4.4	2.3	1.6	....	6.6	15.5	....	2.1	....	286.6
....	45.9	55.8	0.7	11.2	0.6	....	....	....	18.1	651.0
....	4.9	24.3	27.0	13.4	18.8	41.2	....	15.3	....	559.1
....	....	3.3	72.3	....	69.9	51.6	....	5.2	....	551.5
....	241.4	54.4	7.9	81.9	10.4	0.4	....	0.5	....	505.8
....	0.3	0.4	22.6	0.1	....	....	....	5.1	....	458.8
....	....	1.1	0.4	0.1	1.5	63.1	....	0.1	....	247.7
3.1	190.6	1.2	25.2	113.4	8.2	....	13.0	0.2	2.2	388.8
0.9	337.9	8.8	74.0	31.6	8.1	....	....	....	....	525.0
40.8	487.0	1,039.7	492.0	44.7	34.9	13.4	8.0	5.9	....	3,110.8
265.9	213.4	120.3	91.6	4.5	16.3	4.8	....	13.5	67.3	1,331.7
95.6	372.0	174.4	342.6	158.1	40.2	140.4	261.9	113.1	41.9	2,563.0
1,695.4	3,855.0	3,135.7	1,770.7	1,455.2	617.8	707.7	579.3	463.7	195.4	28,730.8
1,800	**4,500**	**3,400**	**2,200**	**1,600**	..	....	....	....	....	**29,600**

STEEL bars retained their lead in tonnage in 1930, increasing their percentage to a full one-fifth of the total. Sheets were in second place, with pipe, shapes and plates, all close together, following, in that order. These five big tonnage items accounted for 68½ per cent of the year's output of all the steel made in the United States, having held the first five positions for some years, over all other forms of steel.

ALLOY STEEL FALLS OFF IN 1930

RETURNS from eight steel producers making alloy steel, including the largest units, show rolled alloy steel amounting to 787,736 tons, which, with 1103 tons of forgings, makes a total of 788,839 tons represented by these companies, with December estimated. These returns do not include certain large tonnages of steel covered in the figures to be reported later by the American Iron and Steel Institute. Prominent among the missing items are copper-bearing steel and a number of other alloy steels in which the alloy constituent is below certain minimum percentages.

While returns on alloy steel were received a year ago from nine companies, the present list of eight companies represents a larger showing, because of mergers effected during the year in which several companies producing alloy steel went together into one unit.

In the table is shown the distribution of the alloy steel tonnages reported by the eight companies. This gives us not only the different types of steel, but also specifies the consuming industry into which the steel went into service.

About 89 per cent of the total comes under the heading of bars. This item showed an actual increase over the report for 1929, whereas practically all of the other items showed decreases. A year ago only 73 per cent of the total reported was in the shape of bars.

Billets and slabs made up the second item in point of tonnage this year with 5½ per cent of the total. Strip steel, the only other large item, shows about 2 per cent of the total. The shrinkage from last year was especially heavy in sheets, which showed only 5578 tons, against more than 80,000 tons a year ago. Pipe also fell off very greatly from the 43,936 tons of last year.

Compared with the entire list last year, when 897,514 tons was reported, the drop has been about 12 per cent.

Five-Sevenths of the Alloy Steel in Automobiles

AMONG the industries taking alloy steels, on the basis of the returns tabulated, the automotive industry was by far the greatest consumer. This outlet accounted for about 71 per cent of the total, against only 62 per cent a year ago. No other industry listed took over 4 per cent.

Building and other construction reached 3.6 per cent; steel going to forging plants was 3.9 per cent; machinery and hand tools absorbed 2.6 per cent; and agricultural implements about 2.5 per cent.

Bars showed so much larger a tonnage than any of the other items that comparisons of the various industries in connection with their takings of various forms of steel would mean comparatively little. It may be noted, however, that the automotive industry took about 75 per cent of the tonnage of bars and that bars represented, on the other hand, about 94 per cent of the takings of the automotive industry.

Bars represented by far the largest proportion of the steel going to forging plants and much the greatest total for the building industry. The same is true of agricultural implements and of machinery, as well as of a number of other items in which smaller tonnages were absorbed.

Only in the item of structural shapes was the automotive industry pushed from first place. Here building construction led, with the railroads in second position.

For 1929 the American Iron and Steel Institute reported a total of 3,764,287 tons of alloy steel ingots. This represented, on the basis of the heavy drop of 39 per cent from croppings and scale, approximately 2,300,000 tons of rolled alloy steel for 1929. Inasmuch as general steel production fell off in 1930 by about 26.8 per cent from 1929, an assumption that alloy steel dropped by the same amount would give us about 1,700,000 tons of rolled alloy steel in 1930.

Alloy Steel Production and Main Channels of Consumption in 1930

(Gross Tons, as Reported by Producing Companies)

	Plates	Structural Shapes	Bars	Black Sheets	Tubes and Pipe	Wire Products	Strip Steel	All Other Finished	Billets and Slabs	Wire Rods	Forgings	Total
Railroads (cars and locomotives)	588	...	7,809	39	...	12	39	39	495	...	245	9,266
Railroads (bldgs. and bridges)	...	296	44	...	...	...	...	15	...	...	...	355
Railroads (track work)	...	...	561	...	...	...	...	...	...	...	...	561
Building construction	1,086	490	2,539	235	...	4	1,320	10	15	...	...	5,699
Building hardware and trim	...	...	1,094	...	...	300	380	5	...	...	...	1,779
Concrete reinforcing	...	...	20,858	...	...	14	...	...	...	232	...	21,104
Automobiles and parts	488	69	525,168	1,408	...	126	9,139	239	22,139	...	147	558,923
Oil, gas and water companies	66	...	8,718	39	100	4	...	25	180	...	107	9,239
Mining and lumbering companies	...	...	757	...	...	9	...	5	...	...	52	823
Agricultural implements	...	1	16,181	...	...	163	1,568	49	1,261	...	...	19,223
Metal containers	...	...	55	...	...	...	39	605	...	...	...	699
Shipbuilding	12	...	493	...	900	...	...	2	...	...	28	1,435
Boilers and tanks	51	...	135	...	...	...	19	5	...	...	...	210
Machinery and hand tools	247	12	18,547	...	...	186	573	27	360	498	378	20,828
Bolts, nuts and rivets	...	...	7,991	...	...	...	...	39	4,663	...	...	12,693
Electrical manufactures	...	...	1,507	281	...	...	760	15	...	...	139	2,702
Forgers	...	...	26,534	...	...	...	...	2	4,309	...	...	30,845
Pressed and formed metal	...	...	811	...	...	...	760	7	...	...	...	1,578
Furniture and stoves	...	...	311	410	...	5	76	75	...	...	...	877
Jobbers and warehouses	...	...	13,248	...	...	120	39	99	...	...	...	13,506
Exports	25	7	4,455	45	...	...	525	36	672	...	...	5,765
Miscellaneous	2,505	191	47,432	3,121	...	621	345	7,335	7,908	1,264	7	70,729
Totals	5,068	1,066	705,248	5,578	1,000	1,564	15,582	8,634	42,002	1,994	1,103	788,839

SCRAP PRICES AT LOWEST IN NINE YEARS

RECESSION SINCE SEPTEMBER CARRIES SCRAP BELOW ALL PREVIOUS FIGURES SINCE JULY, 1921; WITH THAT EXCEPTION, SINCE JUNE, 1915. PRICE NOW ONLY TWO-THIRDS WHAT IT WAS FIVE YEARS AGO, WHILE PIG IRON AND FINISHED STEEL LOST LESS

▲ ▲ ▲

PRICES of heavy melting steel scrap at Chicago, Philadelphia and Pittsburgh have shown an almost steadily declining tendency since September. The drop in that interval has been $2.50, and the present level of $11.25 (week of Dec. 25) is the lowest figure which has been registered since July, 1921. Previous to that there was no figure so low since the second quarter of 1915.

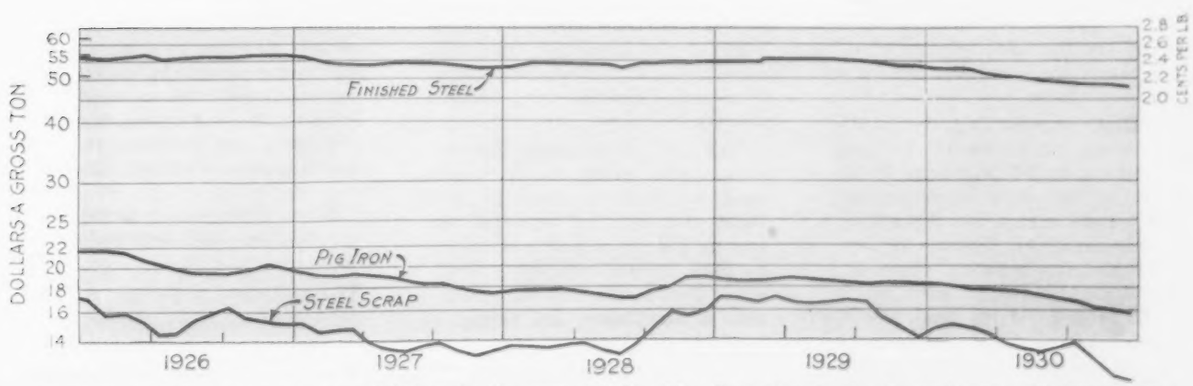
Inasmuch as pig iron has receded less rapidly than scrap—although that also has dropped about $1.25 since July—the differential between pig iron and scrap has reached $4.65, against only $3 on April 1.

Finished steel has shown a similar declining tendency, which has gone on practically without interruption since March. There has been a drop of about 8 per cent in the 9-month period, but this is less drastic than the declines in the prices of either pig iron or steel scrap.

	Steel Scrap (Gross Ton)	Pig Iron	Finished Steel, C. a Lb.
1925 aver.	*$17.12*	*$20.58*	*2.465*
1926 aver.	*15.48*	*20.42*	*2.439*
1927 aver.	*14.00*	*18.55*	*2.357*
1928 aver.	*14.29*	*17.67*	*2.352*
January, 1929	17.02	18.43	2.391
February	16.96	18.38	2.391
March	16.71	18.36	2.391
April	17.18	18.52	2.412
May	16.54	18.70	2.412
June	16.39	18.65	2.412
July	16.60	18.48	2.412
August	16.86	18.38	2.402
September	16.60	18.27	2.394
October	15.58	18.33	2.371
November	14.83	18.36	2.362
December	14.15	18.24	2.362
Year's aver.	*16.28*	*18.43*	*2.393*
January, 1930	14.65	18.19	2.325
February	14.92	18.02	2.307
March	14.88	17.75	2.312
3-month aver.	*14.82*	*17.99*	*2.315*
April	14.30	17.73	2.259
May	13.71	17.60	2.221
June	13.31	17.48	2.207
3-month aver.	*13.77*	*17.60*	*2.229*
July	13.08	17.16	2.177
August	13.29	16.90	2.156
September	13.70	16.70	2.146
3-month aver.	*13.36*	*16.92*	*2.160*
October	12.77	16.31	2.137
November	11.69	16.21	2.135
December	11.28	15.95	2.124
3-month aver.	*11.91*	*16.16*	*2.132*
Year's aver.	*13.48*	*17.17*	*2.209*

Monthly average figures for the past two years are given in the table. Our diagram traces the course of these prices over the past five years. As this is on a ratio scale, proportionate changes show an equal vertical movement in the several curves. It will be noted from this how much more erratic scrap prices have been than either of the other products, and how relatively immobile the finished steel price has been throughout the period.

▼ ▼ ▼



RELATIVE stability is shown by the finished steel price curve, and the widest fluctuations by that for steel scrap. All three curves show a downward trend. Scrap is 34 per cent lower than five years ago; pig iron, 27 per cent lower; finished steel, 13 per cent lower.

AUTOMOBILE

By BURNHAM FINNEY

WITH production in 1930 estimated at 3,475,000 units for the United States and Canada, the automobile industry is emerging from its poorest year since 1922. Of all branches of manufacture affected by the business depression, it has been among the chief sufferers. That it has weathered the storm with so few casualties and faces the future in a strong financial position is a tribute to the excellence of its leadership.

The impaired buying power of the American people in the past year resulted in at least a temporary realinement within the motor car industry. It strengthened the already firm grip of the two low-priced leaders, Ford and Chevrolet, which together made and sold 64 per cent of the industry's total. It likewise brought into partial eclipse companies in the medium-priced field, although a recrudescence is expected in 1931. It saw the outstanding makers in the quality group maintain a relatively good standing despite bad times, thus confirming the belief that the buying habits of the well-to-do are the least affected of all classes of the population during a business slump.

Closely approaching the 1,500,000 mark, production of the Ford Motor Co. in 1930 was some 42 per cent of all cars manufactured. Chevrolet's output was 800,000, or 22 per cent. All divisions of General Motors, including Chevrolet, made about 1,000,000 cars, which is 28 per cent of the total, Thus, Ford and General Motors accounted for 70 per cent of the industry's activities. Chevrolet's announcement that it intends to build over a million cars in 1931 and Ford's expenditure of $60,000,000 in the past 12 months for plant expansion, as well as its plans for spending many more millions the coming year, serve as notice that these two leaders are preparing to hold recent gains.

Medium-Priced Car Makers Hardest Hit

COMPANIES in the medium-priced field have been hardest hit. Oakland-Pontiac, Hudson-Essex, Nash, Oldsmobile-Viking, Reo, Studebaker, Dodge, Chrysler —the names of practically all the well-known cars might easily be included. People who had been purchasing cars ranging from $750 to $2,000 either decided to wait an extra year before trading in their old models or saved money by ordering a Ford or Chevrolet. Therefore the low-priced makers got considerable business which normally would not be theirs, at the same time retaining the major portion of their regular trade during the first half of the year. As the fall and winter came on, however, and the working classes felt more severely the pinch of unemployment and reduced working hours, Ford and Chevrolet sales declined sharply.

Many observers think that the unfavorable situation in which medium-priced companies find themselves will be corrected the coming year by a return of buyers to their normal purchasing channels. That is, the man who usually gets a Studebaker, but bought a Ford the past year, is driving the latter solely because of economic necessity and, as soon as his financial condition permits, he will again buy a Studebaker or some other car in its price range. Whether this return to normal will come in the first half of 1931, in the later months, or not until 1932, one hesitates to predict. However, it will be surprising if it should come before the year is well on its way.

Meanwhile, the medium-priced group has done all it can to tempt the public. It is offering eight-cylinder cars at the price formerly asked for sixes, and sixes have been reduced to a point where they threaten to invade the cheap-car field. It has designed its models with an eye to smart appearance, more graceful lines and an appeal to the comfort of the rider. This desire to give the biggest and best automobile for the money likewise is found in all price classes. The situation which it has created is thus described by an authority in the industry:

"Automobiles today are better in workmanship and equipped with more conveniences than cars produced 15 years ago at much higher prices. The automobile dollar now is worth 122 pre-war cents as compared with the cost-of-living dollar of only 62 cents in terms of 1914 purchasing power. In other words, consumers get twice as much value for their dollar in purchasing automobiles as they do of general commodities relative to the 1914 price."

Motor Companies Successfully Weather 1930 Depression

CHASTENED by the immediate consequences of the October, 1929, stock market collapse and by the realization that 1929 had been a year of heavy overproduction, motor car manufacturers set their houses in order early in 1930 to

INDUSTRY LOOKS FOR FOUR-MILLION-CAR YEAR

weather a business storm. They put into effect operating schedules conforming closely to actual sales, with the result that inventories of finished cars at the end of the year had been substantially reduced. General Motors is an eminent example of the accomplishments in this direction. In the first 10 months of 1929 its sales to dealers exceeded dealers' sales to consumers by 73,942 cars; in the corresponding period of 1930 dealers sold 38,711 cars more than they had received from the factories. Dealers throughout the industry are starting 1931 with minimum stocks on hand.

By aggressive merchandising methods, lowering overhead expenses, purchase of materials for considerably less than formerly and economies in manufacture, automobile companies have been able to make fairly presentable financial statements. Although its earnings are not made public, it is reasonable to assume that Ford's profits the past year were large. General Motors earned $2.85 a share on its common stock in the first nine months and the fourth quarter showing, not yet available, should carry it over its dividend requirements of $3 a share for the year. Many other companies have not fared so well, but it is significant that in the first three quarters of the year companies having greatly reduced sales, like Studebaker, Nash and Hudson, have still been able to make money. The Dow-Jones Co. estimates that net earnings on the common stock of eight leading motor companies in 1930 aggregated $154,650,000, a decrease of 53.9 per cent compared with 1929 and of 58.7 per cent as contrasted with 1928, the year in which the highest record was made.

The strong financial position of motor car makers is shown by the fact that they are entering the new year with larger net working capital, larger net property and plant value and a larger supply of cash than they had at the ends of the slumps of 1927, 1924 and 1921. However, the slack in profits created by passing along constant price reductions to the public has not been taken up entirely in manufacturing and other economies, for in the period from 1925 to 1929, inclusive, earnings of 13 independent companies declined 30 per cent, while production increased 20 per cent, and in 1930 the profit margin was further diminished.

Trend Toward Eight-Cylinder Car Chief Mechanical Change

IN mechanical developments the past year has not been noteworthy. Aside from the Cord's front-wheel drive and Studebaker's free wheeling, recently adopted also by Lincoln, there have been few innovations. Nineteen-thirty-one models already introduced give little indication of radical departures in design. The vogue for eight-cylinder cars is interesting, showing that motorists are demanding more power in their automobiles. The Cadillac achieved such a pronounced success with its V-16 that the Marmon is entering that field. The Cadillac also tapped another field heretofore virtually neglected, that of the 12-cylinder car. Meanwhile, the conservative Packard company has held to an eight.

From the standpoint of manufacturing methods and materials, there has been marked progress. Ford has pioneered in rustless steel, using it for radiator shells and lamps. Ford engineers have done more than merely find a new outlet for this material, as they have established new ways of fabricating it at lowered costs. Almost overnight Ford has become the world's largest consumer of rustless steel. Price alone is standing in the way of the rapid adoption of rustless steel by the industry and it is almost certain that this barrier will be broken down within a comparatively short time.

There has been a wider acceptance of the all-steel body, new



welding processes having contributed to this development. The greater use of steel in the Chevrolet, Hudson and Essex cars for 1931 is an example of the trend in that direction. Even in the quality group the Reo Royale body is a steel affair with four large stampings welded into an all-steel unit. However, this cannot be considered characteristic of higher-priced cars, for wood still is relied upon for custom bodies and for cars which are not manufactured on a production basis. So far as can be seen ahead, authorities believe that the all-steel body will not make much headway in the quality car field.

To emphasize the amazing growth of welding processes in automobile construction, it is only necessary to cite the statement of C. E. Wilson, General Motors vice-president, that his company's subsidiaries are gratified at the results already obtained in welding light stampings instead of machining heavy castings. He predicted further displacement of castings because of the success in welding parts at comparatively low costs.

Predict a Four-Million-Car Year

LOOKING forward to the next 12 months, the automobile industry sees a four-million-car year. It does not expect a boom, but counts on a gradual acceleration of activities as the year progresses. For this reason it would not be surprising to see the bulk of output in the last half rather than the first half a reversal of performance in recent years. Automobile executives have their eyes on 1932 and are preparing the way now for what they think will be a record-breaking year, with a possibility that assemblies will pass the six-million mark for the first time. As justification for this opinion they cite two reasons. In the first place, since 1918 the industry has not varied from a three-year cycle of two good years followed by retrogression in the third year. If this cycle continues, as it has through 1930, the coming year should show a moderate recovery and 1932 should bring another "killing." Second, automobile people point out that most motorists replace their cars every two or three years. In 1930 replacements have been far below normal and probably will continue somewhat less than usual until the average American's income is restored to normal. This would lead the industry into 1932 with a dam of long-postponed business about to break. The rush of orders naturally would be augmented by replacements from the record purchases of 1929.

Incidentally, most automobile executives subscribe to the theory that recovery in their industry is dependent on recovery of general business rather than on a reversal of this process. There is no thought on the part of leading automobile manufacturers of building more cars than dealers actually can sell. This conservative but well-grounded policy carried them through the troublous times

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AUTOMOBILE OUTLOOK FOR 1931

AUTOMOBILE industry expects four-million-car year with probability of setting new high mark in 1932.

* * *

Manufacturers have reorganized production, selling and administrative systems to insure better earnings on modest volume of business.

* * *

Companies are entering 1931 in strong cash position.

* * *

Further consolidations, a few liquidations and survival of small, well-managed companies are likely.

* * *

Strong possibility of medium-priced car makers staging a comeback as year progresses.

* * *

Imposition of high duties on finished automobiles by many countries will not seriously affect foreign sales of American companies.

MAIN MOTOR CAR DEVELOPMENTS IN 1930

SUBSTANTIAL reduction in prices and decreased volume of business responsible for sharp decline in earnings, amounting to 53 per cent as compared with 1929 in case of eight leading makers.

* * *

Eight-cylinder cars have largely replaced sixes in medium-priced class, which has been hardest hit by depression.

* * *

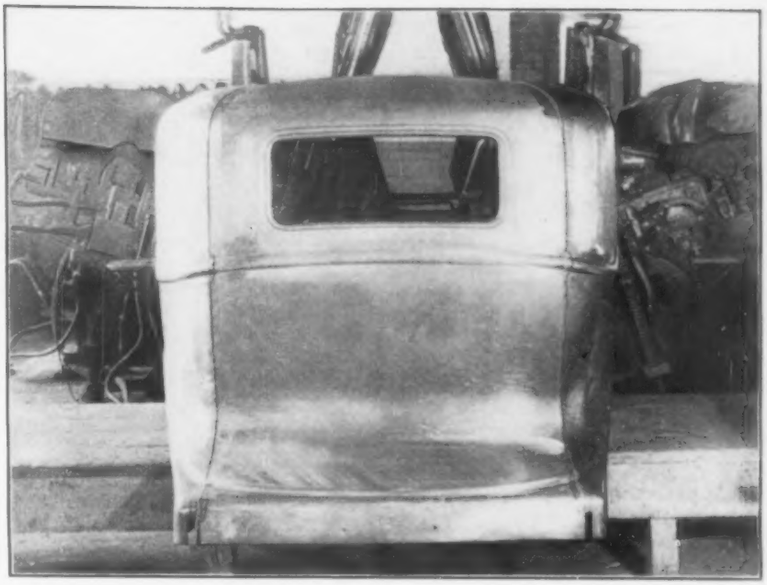
Production in United States and Canada estimated at 3,475,000 cars, of which 64 per cent were made by Ford and Chevrolet.

* * *

Much progress made in use of rustless steel, all-steel bodies and welding.

* * *

Output synchronized with sales, resulting in large decrease in dealers' inventories.



A GOOD example of the growing use of welding in the automobile industry is the rear panel assembly on the Reo Royale eight at the plant of the Murray Body Corpn., Detroit. The assembly is unique in that the rear splash apron or gas tank cover panel is incorporated in body proper, greatly improving the appearance of the rear of the car and finishing off its trim, clean lines. The weld lines are clearly shown. These two welds, each 74 in. long, are made simultaneously in the resistance or flash type electric welder shown in the background. Tests have proved this type of weld to be stronger than the original metal.

of the past year with the smallest possible losses.

What the fortunes of small, independent makers will be is a moot question. Most observers hold to the belief that there will be further consolidations and probably a few liquidations. Nevertheless, it is freely acknowledged that there still remains a place for the small, well-managed, aggressive company. In fact, it serves a useful purpose for the larger, more ponderous organizations by pioneering in style and engineering changes which may or may not meet with the public's tastes. It can do this at a relatively low expense, whereas companies on a mass production basis would have to gamble millions to find out whether the public is willing to accept a new idea. Under the circumstances it is reasonable to believe that the larger manufacturers are not eager to see their smaller competitors entirely eliminated.

Companies Enter 1931 Adjusted to a Moderate Volume

LONG ago the automobile industry established a reputation for its willingness to discard the old for the new overnight to revolutionize manufacturing methods and merchandising plans on short notice. Its greatest test came in recent months, when it was compelled to readjust its entire structure in order to avoid heavy losses. The result is that many companies, including Hudson-Essex, Chrysler, Willys-Overland and General Motors, have publicly announced that they are entering 1931 in a position to make a better financial showing than in the past year on a comparatively modest volume of business. Most people intimately associated with the industry agree that conditions in 1930 presented the most crucial test in the history of automobile manufacturing and the fact that there has been scarcely a casualty is a notable achievement.

What may happen the coming year in the case of individual companies or of certain price groups is tied up with "ifs." If the medium-priced cars regain some of their lost ground, will Ford and Chevrolet sales be seriously affected? If Ford enters the eight-cylinder field, how will it affect the fortunes of his competitors? These and numerous other questions are heard. With the buying power of farmers and factory workers seriously impaired, it seems probable that in the early part of the year, until these buyers can get back onto their feet, a considerable part of the low-priced car market will yield

(*Continued on page* 109)



MOTOR trucks are rapidly replacing the old-fashioned hay wagon on the American farm. This is one of the growing uses of motor trucks. The photograph was taken at Billings, Mont.



GAINS IN

By CLARENCE M. YOUNG

Assistant Secretary
of Commerce for Aeronautics

THOUGH aircraft manufacturing has suffered somewhat of a setback in the past year in common with other industries, the phenomenal growth in airplane transportation assures the future growth of airplane production on a sound basis. More than 1,000,000 persons rode in airplanes in first six months of 1930, a four-fold increase in one year. Air mail poundage also increasing, but at a lesser rate. Designs of new airplanes tending more to the use of metals point to increasing demands upon the metal industries.

RESOURCEFUL metallurgists and manufacturers of metal products have found a new opportunity in aeronautics.

Sales of metals for aircraft construction do not compare in volume now to sales for such work as building construction, for example, but from the viewpoint of the metal man, it is interesting that steel and aluminum alloys have become necessities for many aircraft builders. Manufacturing of aircraft is bound to increase, and the industrial plants that furnish steel and aluminum alloys for aircraft today in comparatively small quantities doubtless will be handling large scale orders in the future.

A quarter of a century ago, when the first airplanes were being built, wooden construction was the accepted practice, and if anyone thought of using metal for the framework, his idea had little opportunity for practical application. Designers did not turn to metal for anything except engines and some small fittings, until suitable materials became available just after the World War. With the development of methods of working the metals so that they could be made thin enough to eliminate excessive weight without the loss of too much strength, a new type of aircraft appeared. We now have airplanes and airships built entirely of metal and other aircraft with sturdy metal skeletons inclosed in wood and fabric covering.

However, this does not mean that metal has supplanted wood in aircraft construction. It would be idle to say that the usefulness of planes of wood construction will disappear—the case of wood vs. metal must be decided along the airways and wherever airplanes fly, and it may be that the decision will be divided between the two.

Metals Increasingly Popular

ON the other hand, it is evident that metal has become increasingly popular among aeronautical designers. Carbon steel and chrome molybdenum steel serve admirably for fuselage construction. In the form of tubing, the necessary strength is obtained without excessive weight, and both of these metals are quite suitable when welded parts are needed.

The aluminum alloy, which owes at least a part of its reputation to the use that has been made of it for aeronautic purposes, contains, in addition to aluminum, small amounts of copper, manganese, magnesium, silicon and iron. Its weight is approximately one-third that of steel, and it can be used therefore in sheets, without loading an airplane beyond the capacity of the motor to lift both the working structure and a certain amount of pay load. This metal can be forged and hot stamped. It is used for airplane wing ribs, which are riveted into place. Corrugated and used as a covering, it adds substantially to the strength of the wing or fuselage. If the design does not call for much of a contribution of strength from the covering, the metal can be riveted into place in flat sheets.

Aircraft engines, always of necessity starting as ingots of metal,

AIR TRAVEL ASSURE GROWTH OF INDUSTRY

have improved in efficiency and reliability, thanks in part to metallurgy. The average weight of an engine per horsepower produced, has decreased about 35 per cent in 10 years. For these power plants, various grades of steel are used, also magnesium metals and aluminum alloy castings.

In addition to these special metals, aircraft designers provide in their specifications for many products that can be obtained from regular stock. Copper wiring for ignition systems, bolts and washers, fittings for connecting parts, even if they require machining of a type peculiar to airplane construction, are made of material that has long been produced in quantity. Efforts of air transport operators to make the interiors of their cabins comfortable and attractive have opened up a field for manufacturers of the best quality of hardware, and many of these plants are producing special lines of chairs, lamp fixtures, door handles and the like.

All of these uses for metal in the aeronautic industry are well established. Many metallurgists are as familiar with them as are the aeronautic designers and manufacturers, because the metallurgists helped to plan for them. Doubtless, also, the metal producers were and are looking more to the future than to the immediate present.

Air Transportation Expanding

IT is easy to say that aviation is bound to develop and expand; any one will say that of the industry in which he is most interested. And 10 years ago it might have been difficult to find means of backing up such a statement with regard to civil flying. Now, however, air transportation has found its place in the general industrial scheme of the world, and has on record accomplishments that emphasize its capabilities.

More than 1,000,000 persons in the United States rode as passengers in airplanes during the first six months of 1930, according to surveys of scheduled and miscellaneous flying operations made by the Aeronautics Branch of the Department of Commerce. These surveys showed that miscellaneous operators carried 924,800 passengers, and scheduled air transport lines (both domestic and American operated into foreign countries), carried 208,357 passengers during the same period. The total number of passengers carried in all types of operations from January to June, 1930, was 1,133,157. Scheduled air lines also carried 3,761,376 lb. of mail and 1,245,477 lb. of express.

The total of 208,357 passengers carried on the scheduled air lines in the first six months of 1930 represents a four-fold increase over the number carried in the corresponding period of 1929. Direct comparisons are made between the first six-month or between the last six-month periods of two calendar years, as flying conditions are more favorable during the last half of the year, and this fact therefore usually is reflected in the totals.

However, the number of passengers carried in the first half of 1930 was greater by 87,425 than the number for the last six months of 1929. The number of passengers flown during the entire year 1929 was 173,405.

Air mail poundage also increased during the six months' period over the similar period last year, but not in so great a degree as did passenger traffic. The air lines carried 3,761,376 lb. of mail from January to June, 1930, as against

(*Concluded on page* 108)



Col. Clarence M. Young

BUILDING CONSTRUCTION EXPECTED TO



By THOMAS S. HOLDEN
Vice-President in Charge of Statistics and Research, F. W. Dodge Corpn.

THE year 1930 opened full of hope that the recession then under way would be short-lived and that the rigors of a major depression might be avoided. In spite of several false starts at recovery, these hopes were in the main disappointed. To be sure, a record volume of public works and utilities projects served to mitigate the severity of decline in private building operations, but this was not enough to prevent a decrease from 1929 of nearly 25 per cent in total construction expenditures.

More and more was it borne in during the year that the private building programs of the 1925-1929 boom period had over-anticipated the actual needs of the country and, stimulated by easy credit, overproduced buildings to a very considerable extent. It is probably somewhere near correct to say that the private building needs of the country had been over-anticipated by about a year at the end of 1929.

The end of 1930 finds the country with part of the necessary readjustment of its building and engineering program completed. Residential building began to fall off during the latter part of 1928, continued to decline through 1929 and 1930. Apparently, it struck bottom in 1930 at a level 60 per cent under the peak volume. During most of 1930 there was a sidewise movement in residential building, with a definitely upward movement in contracts for apartment buildings in metropolitan New York during the last four months of the year. While the most recent vacancy surveys indicate for the country as a whole a continuing surplus of residential space, this class of building seems to have more nearly completed its necessary readjustment than any other.

Residential building demand is likely to pick up in the spring of 1931 (not everywhere necessarily, but in enough places to produce an appreciable improvement) and to continue on the upgrade through the year, with a sizable, though moderate, increase in total volume over 1930. Along with any increase in residential building would be likely to come similar increases in new and alteration projects under $5,000 such as are not recorded in the Dodge contract statistics. Should this upward trend eventuate, larger numbers of small projects scattered over the country would characterize the year's building program to a greater extent than such projects did in 1930. These would employ larger numbers of architects, contractors, builders and building craftsmen.

Rise in Commercial Building Must Await General Business Recovery

COMMERCIAL and industrial buildings reached their peak in 1929 and started on the downgrade in 1930. Just as an upturn in residential building always precedes a recovery of general business, so must general business recovery precede increases in commercial and industrial building. Furthermore, large surpluses of both classes are reported to exist in many cities all over the country. With reference to office buildings, the National Association of Building Owners and Managers reported a vacancy percentage of 13.92 on Oct. 1, 1930, the largest in a number of years and practically 4 points over the normal 10. Consequently, most if not all of 1931 will be required to complete readjustment of demand and supply in these two important classes of operations, and their 1931 volumes are likely to fall considerably below their 1930 volumes.

Public and institutional buildings increased during the boom years, but not at the breakneck speed of residential and commercial buildings. Their volume declined only slightly in 1930 and may fall a little further in 1931, but any such decline is likely to be slight. As a matter of fact, the building boom of 1925-1929 was largely a city and suburban real estate boom which left community facilities lagging somewhat behind community needs.

Public Utilities Construction May Be Less in 1931

NEW construction by public utilities is likely to be somewhat less in 1931 than in 1930. With regard to public works, it is difficult to make a definite forecast. The country had a record volume of such work in 1930, and economic considerations alone would seem to indicate little likelihood of a second record-breaking year in a period of such far-reaching re-

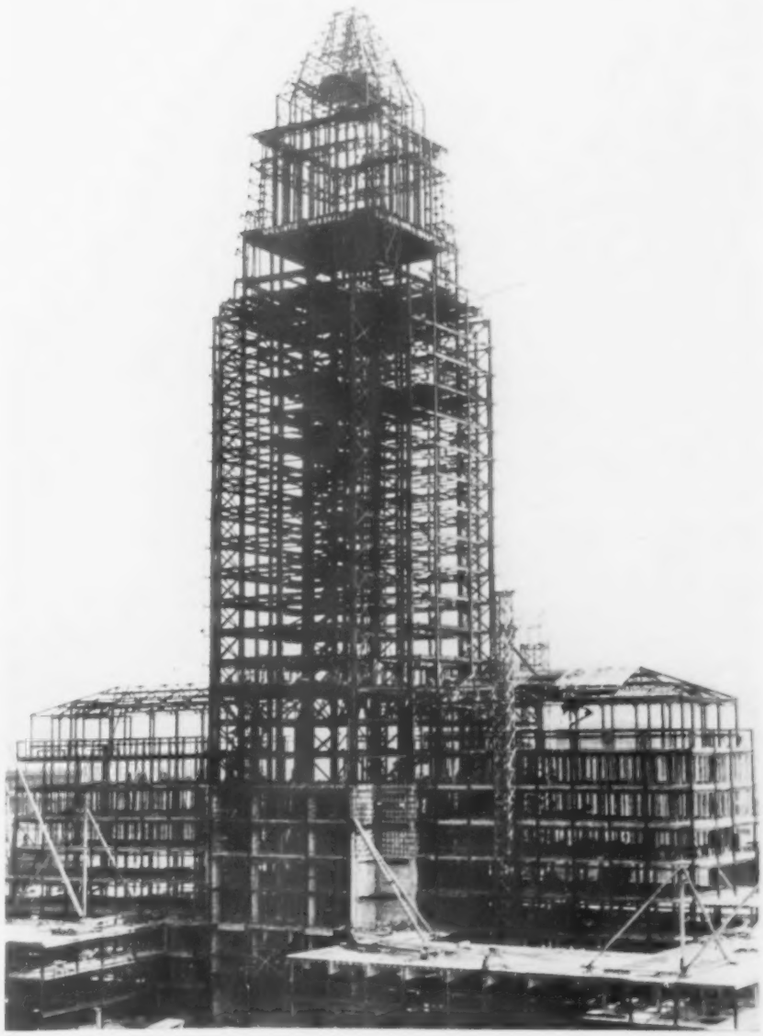
IN 1931
UNDERGO SLOW RECOVERY

WITH part of the necessary readjustment in building activities completed, 1931 is expected to bring a fair measure of recovery from the depression that has affected some branches of the industry in 1930. Residential building, an upward trend in which always precedes a recovery in general business, apparently struck bottom in 1930, and is likely to pick up in the spring of 1931. It is predicted that the total volume of construction in the five-year period, 1930-1934, will be less than in the 1925-1929 period, when it was considerably in excess of normal requirements.

adjustment as the present one. The limitations on this class of work are the limitations of funds available from taxation and from bond issues; such limitations are now being considered even in the discussions of possible enlargement of public works progress. Conservative estimating would anticipate the probability of some decline in this class of work, and would also admit the possibility of an exceptional vigorous campaign by public officials looking to a bigger program than ever before.

In the accompanying chart, the estimated total for 1931 is set just a little under that of 1930. The figure was arrived at after making a careful estimate of what would be likely to happen to each important building and engineering classification, including low-cost new and alteration work under the $5,000 minimum valuation of the Dodge contract records.

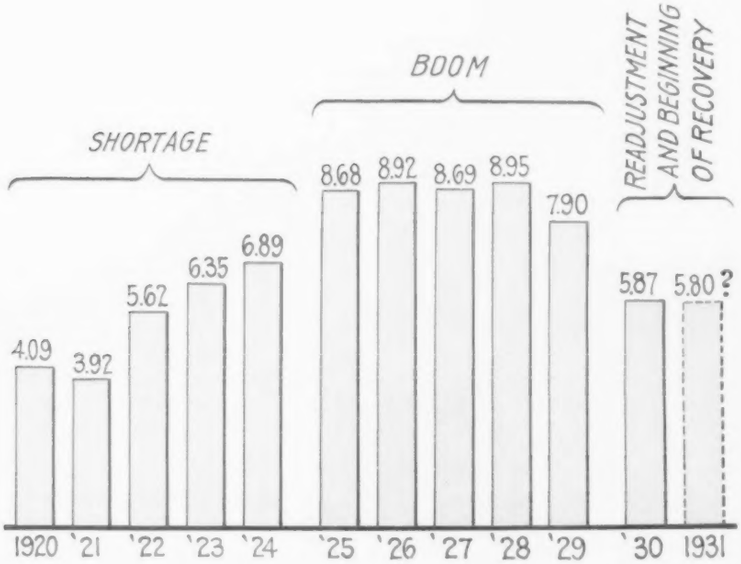
If the 1931 total should approximate that of 1930, this would result from a balancing of residential and small-project increases against possible declines in the other classifications. Variations in



STEEL skeleton of Los Angeles City Hall, one of the tallest buildings on the Pacific Coast, being built at a cost of $6,000,000.

the extent and speed of residential recovery and the extent of further declines in other classifications would cause the final 1931 total to vary more considerably from that of 1930 than indicated by the narrow margin of the estimate. At any rate it now seems more than probable that 1931 will have a total volume nearer that of 1930 than that of any other recent year.

Such a course as is here indicated for 1931 would mean a more normal realinement of the year's program as between the several classes of building work, completion of readjustment, beginnings of recovery and preparation for a period of expanding activity in 1932 and thereafter.



Estimated total building and engineering expenditures in the United States. (Figures in billions of dollars.)

Construction Program of 1925-1929 in Excess of Requirements

VIEWING the chart that is appended to this article, it is seen that the country's estimated total investment in new building and engineering work in the years 1920-1924 was approximately $27,000,000,000. That five-year program wiped out the building shortage that existed at the end of the World War. Growth requirements of increasing population, expanding activities and augmented wealth would have required a volume in the succeeding five years well above the 1920-1924 total, but the events of 1929 and 1930 show us that the actual construction program of 1925-1929, totaling $43,000,000,000, was considerably in excess of normal requirements. There is little wonder, in the light of all that has recently been learned of our economic situation, that two years of drastic curtailment (1930 and 1931) are required to right the situation. Although the decade 1930-1939 will probably call for a larger construction volume than that of 1920-1929, it does not now seem likely that the five-year period, 1930-1934, can have a total construction volume equal to that of the 1925-1929 period unless new developments of far-reaching nature that are not visible today enter into our economic picture. This is another way of saying that, in all probability, it may be 1933 or 1934 before we get another year's construction total equal to that of 1928.

A Slow Recovery Regarded as Wholesome for Industry

SUCH a slow recovery as is indicated above will be a wholesome thing for the building industry. During the past decade it made much progress in technique of design and construction, many improvements in materials, equipment and conveniences, and has developed better methods of cooperation among the various elements in the industry—designers, constructors, material manufacturers and supply men, building labor and building finance.

Slow recovery will give an opportunity for the economic lessons learned in this readjustment period to sink in; enhanced competition within an industry with a surplus production capacity will give opportunity for technical efficiency, technological improvements in uses of materials, and elimination of cumbersome and uneconomic practices. Sounder methods of financing and, perhaps, some measure of control of real estate and building speculation may result. Building and real estate, twin enterprises, came of age as national industries in the decade just closed. In the new decade they will have an opportunity for closer coordination and an improved capacity to handle the larger national construction programs that lie ahead. Among the most widely discussed technological improvements that have been started and that appear to have big possibilities of wider development are the new uses of metals in buildings, both as structural members and as exterior-wall materials.

Looks for Normal Steel Consumption in 1931

By E. T. WEIR

Chairman, National Steel Corpn.

I LOOK for a normal consumption of steel during the next year, which means a tonnage considerably above that produced in 1930. If the steel industry can still be considered a barometer of trade, as it has in the past, I think there is assurance that we are close to the turning point and can confidently expect 1931 to be a year of more normal general business.

Stocks of finished steel products in consumers' hands have been heavily reduced for the past 15 months and are now about the lowest that can be expected under our present standard of living, which entails an individual consumption much above the pre-war standard.

One very excellent reason for a hopeful view of the steel industry is that this is the first time in its history that it has gone through a severe depression without generally reducing wages.

This maintenance of wage scales has enabled the industry to reduce costs and give the consumer more for his money. The experience of our company, like that of other large units in the industry, is that maintaining wage levels has produced a higher standard of labor efficiency among our 15,000 employees, thus reducing costs without impairing the individual's buying power.



Photograph by John P. Mudd for the Midvale Co.

Hollow forging, about 78 in. outside diameter, 72 in. inside and 50 ft. long, weighing 136,000 lb., is being bored and turned for a pressure cylinder for an oil refining company.

MACHINERY DEMAND FELL SHARPLY DURING 1930

By W. H. RASTALL
Chief, industrial machinery division
United States Department of Commerce

THE machinery industry has long been known as either "prince or pauper," meaning that in this industry when times are good they are royally good, and when they are bad, unless offset by a good management, machinery building shops struggle with most trying conditions and become pauperous or worse.

The year just closed has again illustrated how all this happens. For example, the following tabulation gives the collective experience of those companies reporting to the National Machine Tool Builders' Association. Obviously, the experience of certain individual firms was even more extreme than this average.

Index of Machine Tool Orders—1930

January	182.0
February	170.2
March	181.2
April	179.1
May	135.1
June	125.8
July	91.1
August	113.8
September	135.9
October	90.1
November	60.4

What a toboggan! New orders at less than 19 per cent of the peak only 13 months previously. Unfortunately, full statistics regarding the entire machinery industry are not available, so that it is not possible to state with certainty just what situation was faced by machinery builders generally. But, theoretically, the business cycle affects all manufacturers of capital goods similarly, and the toboggan has been faced in greater or less degree by the ten thousand machinery builders of this country during the past year, the degree varying up or down according to the individual circumstances of each.

Moreover, this is not a unique experience. In 1919-1920 machinery builders enjoyed a boom quite similar to that of 1928-1929, and in 1921 there was another depression presumably quite as severe as that which we now have with us. In the earlier instance the low point represented new orders not over 8 per cent of the previous peak, a decline that took place in about 15 months, seriously straining the resourcefulness of management which is compelled to face even more serious complications, because expansion on the upward swing of the business cycle is apparently as severe, sudden, and sharp as is the collapse when the machinery-building business hits the toboggan.

Prophecy is futile, but it will be suggestive, perhaps, to trace again the way in which the curve for machine tool orders recurred following the low point in 1921; after that extreme was reached there was a sharp and rapid recovery for perhaps 18 months, then a recession. Since 1921 there have been three very interesting and perfect business cycles, the low point recurring in the late summer or early autumn of each third year with striking regularity. Furthermore, each low point up to the present has been considerably higher than its predecessor, as also each high point. There has been a very strong upward trend on the whole. Industry is being mechanized rapidly and the upward trend of this curve appears to measure the progress being made. This advance, which is very positive and striking, appears to be definitely checked by the present depression, the low point of which appears to be in danger of going nearly as far down as in 1921.

Need for a Better Equipment-Buying Policy

The more one reflects upon these phenomena, the more important appears the need for a better equipment-buying policy on the part of manufacturers. This is illustrated quite vividly in figures recently issued regarding the railway situation. For present purposes, let it be recognized that compared to the machinery building industry the transportation industry is very stable. Yet, in the five-year period, 1905-1909, new purchases averaged 3911 locomotives annually. In 1910-1914 this average decreased to 2259; in 1915-1919 to 2178; in 1920-1924 to 1670; in 1925-1929 to 892. We are inclined to assume that railway managers, as a group, have given but scant consideration to the problem affecting the managers of enterprises building locomotives in spite of the fact that the prosperity of the locomotive shops influences the prosperity of the railways.

From the broader point of view, all industry depends upon the machinery builders not only for equipment but for progress, and the year 1930 suggests that in the absence of more stable buying policies on the part of equipment users the management of machinery building establishments is forced to face economic problems of such severity as to definitely restrict technical progress. American industry appears to be paying too heavy a price for this economic sin. The subject is somewhat involved because it needs to be considered from the accounting side, the management side, the technical side, in fact, every side. Depreciation and obsolescence are factors, and when neglected easily exercise a demoralizing influence not only on the machinery building industry, but on all industry. At the other extreme, when equipment has been purchased too freely we find the purchasing industries afflicted with excess capacity, and the evils of unintelligent competition and profitless prosperity that follows in the train.

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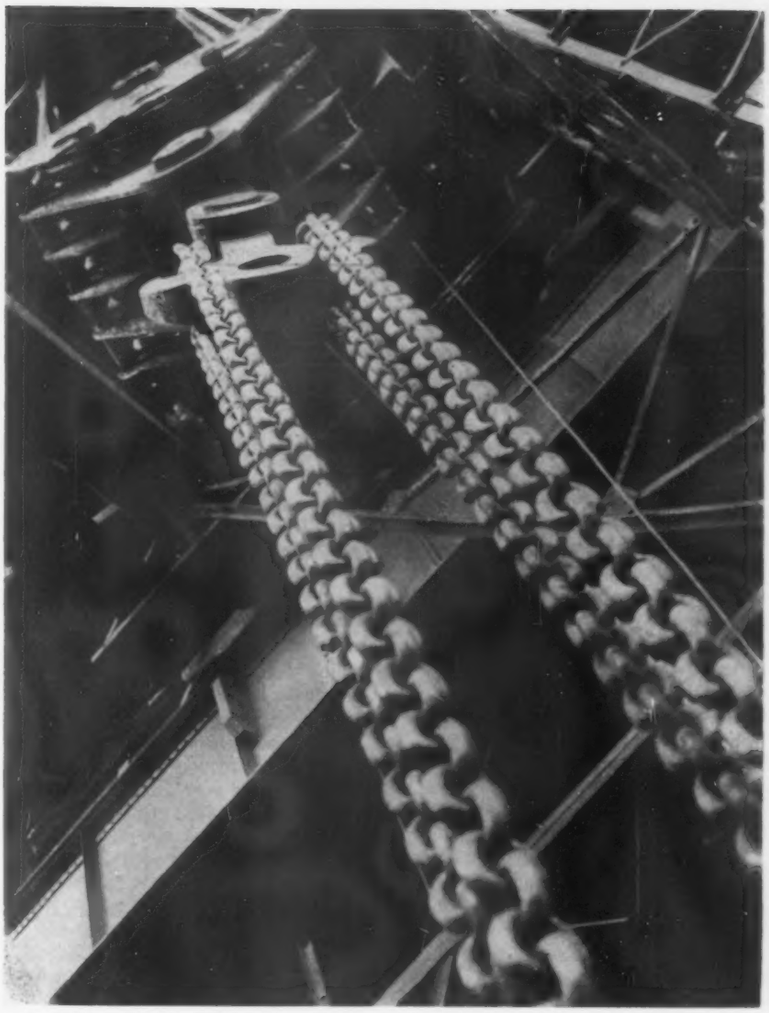
THE "prince or pauper" character of the machinery industry is again reflected in current orders for machine tools, which in November were less than 19 per cent of those of October, 1929. Although comprehensive statistics are lacking, a somewhat similar falling off in orders is believed to apply to the entire machinery industry.

Mr. Rastall points out that such a situation is not unique; he sees the need for a more stable equipment-buying policy on the part of industry generally, uninterrupted technical progress being a major advantage accruing from such a policy.

Contrary to ordinary expectancy, machinery exports ran ahead of general exports until July, showing in the same period an expansion over the previous year. This, Mr. Rastall says, probably reflects desire on the part of foreign peoples for economic self-sufficiency and for mechanization that will permit closer approach to American standards of living.

In spite of the gloomy present position, machinery builders look for early recovery of both domestic and foreign demand. In this, replacement of obsolete equipment will be prominent.

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Machinery Exports Good Until July

Queerly enough, the curve representing exports of metal-working machinery appears to have many characteristics in common with the curve covering domestic business, which has been described, with the qualification that where ordinarily we would expect machinery exports to fall off sooner than general exports, the reverse has happened. Up to July, machinery exports represent an expansion over the previous year, although generally, exports had declined severely. Since July the export curve has also tobogganed.

One may draw his own conclusions regarding the meaning of this, but probably it expresses the ambition of every country for economic self-sufficiency. All the world is anxious to manufacture at least to meet its own requirements. Foreign peoples, individually and collectively, appear to realize that they will be able to raise their standard of living through the more liberal mechanization of industry, and the persistency shown by this trade in the early months of the past year, in the face of the approaching depression, appears to express the keenness of this desire for mechanization which will lead to a closer approach of the American standard of living.

Machinery Industry Expects Early Recovery

In spite of the very gloomy present position of the machinery industry, manufacturers appear to look forward with confidence to an early recovery both at home and abroad. The quiet months have afforded opportunity to catch up with the backlog of orders that had accumulated, to relax somewhat from the high pitch of production of 1928-29, to devote time to the development of new designs and the improvement of a thousand details; unquestionably it will be found when buying revives that greatly improved equipment is available.

Present circumstances appear to justify not only the hope but the expectation that in the near future not only the machine-tool industry but the entire machinery industry will enjoy an improving demand. Orders for new equipment will increase, the mechanization of industry will revive, not only in this country but all over the world, somewhat as it did following the experiences of 1921 but on a larger scale. In addition, unlike that earlier period, we may also hope that increased attention will be given to replacement business, for many industries at home and abroad are known to be cluttered up with obsolete machinery, which will now be brushed aside as soon as industry can be led to understand the benefits that will flow from the establishment of a real equipment policy, a principle of management which should protect us from the evils of excess factory capacity, as well as the evils that flow from too long operating of decrepit and obsolete equipment.

3 BILLION DOLLARS MAY BE

HIGHWAY construction and maintenance expenditures in 1931 will reach unprecedented proportions and possibly will exceed the tremendous total of $3,000,000,000.

That this outlay will be made is indicated by a careful survey just completed by the American Road Builders' Association. Returns that organization has received from 44 State highway departments, with estimates for the four remaining States, disclose that State expenditures already planned aggregate $840,850,000. To this are added the regular Federal aid appropriation of $125,000,000 and an emergency appropriation of $80,000,000 by Congress, estimated city expenditures of $875,000,000 and estimated county expenditures of $660,000,000. These sums alone amount to $2,580,850,000, or $730,850,000 more than the previous record of highway expenditures of $1,850,000,000 established in 1930.

The 1931 estimates do not take into account further appropriations now being considered by Congress and those which will be made by State legislatures when they meet during the present month. It is unofficially estimated that the additional funds to be made available for highway construction will approximate between $500,000,000 and $600,000,000.

In the past, estimates of the American Road Builders' Association have fallen short of the actual expenditures and therefore it is probable that those for 1931 are conservative.

The estimate for city expenditures was arrived at by using 1930 figures as a basis and calculating the trend of increase, ranging from 10 to 20 per cent. The sharp increase in local road construction is indicative of the additional importance being given to the county road program.

Attention Centered on Secondary Highway Systems

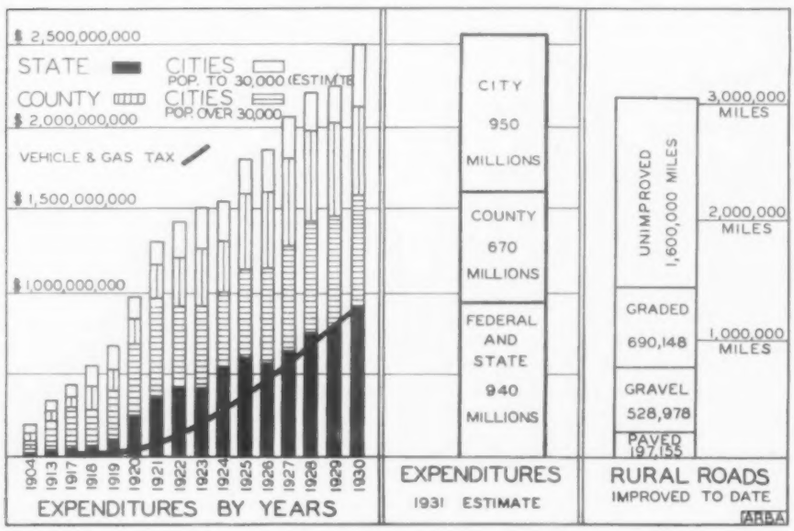
STIMULUS to highway construction was started by the first Federal road act, signed July 11, 1916, by President Woodrow Wilson. It appropriated $75,000,000 to be distributed among the States, which then, as now, have the privilege of matching the Federal funds dollar for dollar. Last spring Congress increased the appropriation to $125,000,000. The result of these appropriations over a period of 14 years has been to build up a system of splendid State highways.

With construction of primary roads practically completed, attention is being turned more intensively to the building up of secondary systems, a fact which explains the increased funds being applied to local road building. The vast sums being spent by cities likewise reflect recognition of the necessity of building and maintaining modern thoroughfares to meet requirements of the enormous motor traffic that has developed and is developing. Funds for highway construction come from bond issues, license fees, gasoline taxes and specific appropriations directly made.

The development of local road construction has reached a point where it is much greater in mileage than State highway building. In 1930, approximately 45,481 miles of local and 32,522 miles of State highways were built. It is estimated that these mileages will be exceeded by at least 20 per cent in 1931, reaching about 54,500 and 39,000 miles respectively. A great many States are giving greater shares of funds from gasoline taxes toward county road building and there is also a growing movement in favor of giving Federal aid funds for this purpose, negotiations to this end already are proposed for the 1931 program in South Dakota, Indiana and Nebraska.

Increase in Road Work Partially a Normal Movement

THE striking impetus in road building is, of course, largely due to the necessity of relieving the unemployment situation and industrial depression. However, the increase is partially a normal movement. The public and Federal, State and local officials realize



The American Road Builders' Association estimates a minimum of $2,500,000,000 for road building in 1931, with the possibility that emergency appropriations of States and municipalities may put the figure up to $3,000,000,000.

SPENT FOR ROADS IN 1931



that the matter of having good roads is an economic necessity as well as a convenience for modern transportation. Good roads are good business, and therefore a sound investment. Road building requires labor, a large variety of products from industry, and provides quick communication to and from markets, helpful alike to labor, industry and agriculture. Bond issues and other forms of raising funds offer sound investment for the public.

So while President Hoover and other officials have turned to programs of increased highway construction as one means of relieving unemployment and aiding business, the step taken is no mere expedient. Road building is a fixed, normal program, necessary to the development of a modern country. From the founding of the United States, road building has been turned to with increased energy for the purpose of helping labor and business, but likewise it has been recognized from the time of George Washington down to the present as an essential to trade and commerce.

The immediate purpose of providing funds for highway construction, however, is to get the unemployed to work and to get orders to manufacturers of materials so that the wheels of industries can be speeded up. The industries affected cover a wide range. Iron and steel, metal-working machinery, road machinery, bridges, cement, sand, crushed stone, vitrified brick and asphalt are all needed for road building. The railroad and motor truck tonnages hauled are large. The cycle of business thus started reaches all forms of business and industry.

The far-reaching effect of road building on labor is shown by the estimate that more than 50 per cent of the road building dollar goes directly to labor. On this basis it may be calculated that in 1931 labor will receive at least $1,500,000,000 from the road building program. About 25 per cent more is said to go to labor for the production of machinery and materials.

The number of people engaged in the building and maintenance of roads and streets has never been determined accurately. But an idea may be obtained from the fact that on Federal aid construction alone—a comparatively small part of the total expenditure—47,686 men were employed in September, 1930. It has been estimated that Federal aid is only about 5 per cent of the total expenditure. On that basis, it is estimated that the program of 1931 will call for about 900,000 laborers, engaged for eight months or more.

Bond Issues of $250,000,000 or More Voted in November

THE appeal that road building has made to the public for both emergency and normal purposes is shown by the fact that bond issues totaling more than $250,000,000 were voted by various States in the November elections. The total highway and maintenance construction programs of the States already determined upon for 1931 will draw on funds from these issues as well as from the other sources. Of the $840,850,000 expenditures already assured for the 48 States, $770,250,000 will be spent for construction and $70,600,000 for maintenance.

It is an interesting and significant fact that the income from gasoline taxes and motor vehicle registration, which amounted to $790,000,000 in 1929, has not been noticeably affected by industrial depression. Practically all this in-

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ROAD building programs for 1931, which may require expenditures of three billion dollars, or nearly 40 per cent greater than in 1930, offer one of the brightest prospects in relieving industrial depression and unemployment. State expenditures will be $840,850,000, Federal aid $125,000,000, estimated municipal outlay $875,000,000 and estimated county expenditures $660,000,000, in addition to which State legislatures, meeting this month, are expected to make further appropriations, and Congress has voted $80,000,000 for emergency loans to the States for immediate highway construction, in addition to the usual Federal aid.

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GROWING INTEREST IN FARM ENCOURAGES



RECENT improvements in design and important additions to manufactured lines of farm implements, growing recognition of the agricultural problem by the nation and the attitude of the farmer in his desire to cut costs are among the important factors pointing to a general upward trend for the farm implement manufacturing industry so soon as general business conditions right themselves.

It is true that this industry is facing hard facts because of the world business depression, but its leaders can recall when conditions were worse, as for instance in the post-war depression of 1921. At that time the industry was confronted with heavy inventories of high-priced goods and high-priced materials. This situation today is relatively good. Further, the farmer's attitude toward the use of machinery is far more favorable today than in 1921 and the industry feels that when the farmer is able to get back into the market for equipment he will do so more speedily and strongly than ever before. On this score, many farm implement manufacturers prefer to take the long-range view that the next five years will prove more profitable than the last five years.

The farmer's ability to buy is a subject on which there is wide divergence of opinion. The Department of Agriculture reports the total value of crops produced in the United States in 1930 at 25 per cent below the total value in 1929. While surpluses of some farm products exist, it is argued that surpluses result in low prices, which in turn discourage production, and that higher prices will therefore return.

Others say that the efficient low-cost farmer is a strong influence in establishing market price levels and that the higher-cost farmer will be forced to buy and use machinery if he is to remain on the farm. As an example of what this may mean, there are about 1,000,000 tractors now in use on the 6,000,000 American farms. Many of these farms are small, but it seems reasonable to assume that at least 2,000,000 more farms will eventually be equipped not only with tractors but with many other types of farm equipment.

ALTHOUGH farm buying power as a whole has been curtailed by low crop prices, the outlook for a fair demand for machinery of improved types is favorable because of the growing recognition of the need of low-cost farming. The farm machinery industry, having small inventories of raw materials and completed goods, is in good position to go ahead quickly when the farmer gets back into the market.

Farmer's Buying Power Somewhat a Local Condition

IN some respects it is quite evident that the farmer's buying power is a local or even a personal condition. For example, in November a trainload shipment of tractors moved from the Middle West to Texas and it is important to note that every tractor in this shipment went to a farmer who had signed an order for it and had bought it outright. The observation has been made in Texas that present low levels of crop prices have brought the introduction of power farming equipment into that territory at least 5 to 10 years

MECHANIZATION IMPLEMENT INDUSTRY



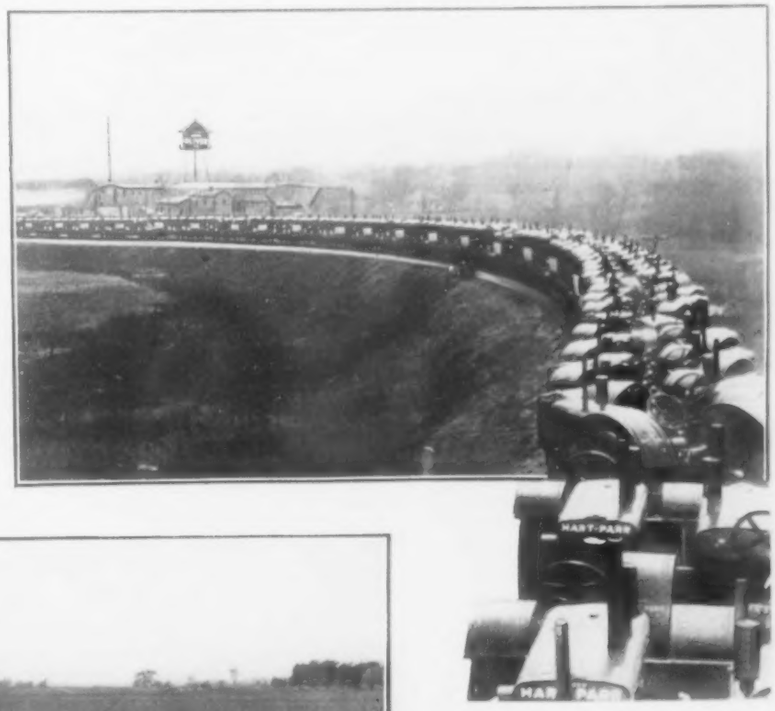
sooner than it otherwise would have come. This is an example of cost competition in a low-price market of world dimensions.

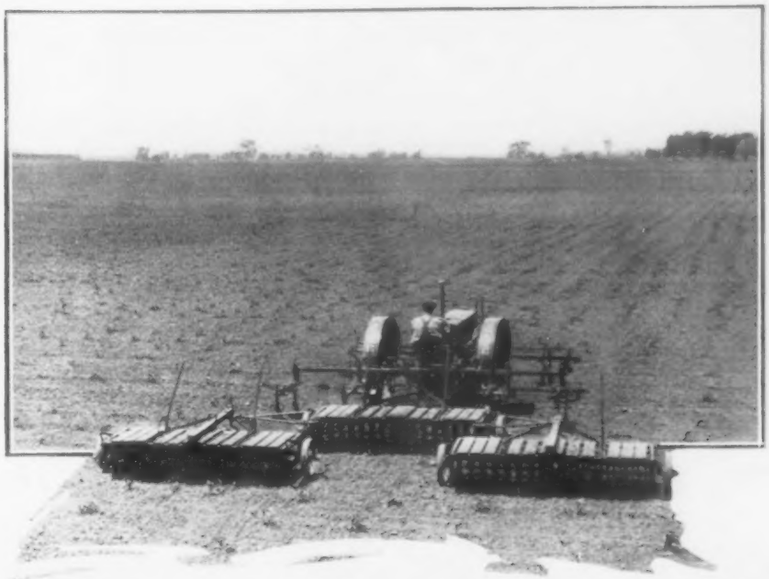
Taken as a whole, the farm implement industry is in good physical condition. Heavy expenditures have been made for modern machine equipment and line production is established where it is practicable. Quality of workmanship is on a high plane and the selection of materials used for manufacturing purposes is extremely thorough. Special steels are being used where experience demands, and heat treatment is highly developed and extensively used by the industry. Sheet metal and other forms of steel have taken the place of wood in many of the new designs.

Many Improvements in Farm Machinery

THE past year probably established a record from the viewpoint of improvements in farm machinery and extension of its use. Three-row potato planters, which will distribute fertilizer if desired, have appeared on the market. New weeding machinery for potatoes is now available, and developments and refinements on corn pickers are noteworthy. The serviceability of combines has been increased.

At one time combined-harvesting appeared to be limited largely to small grain production. Now farmers have found that soy beans, cow-





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SOME farmers have buying power. Every tractor in the trainload pictured above went to a Texas farmer and was an outright purchase.

Development of machines for the corn grower is of outstanding importance in farm mechanization. The general purpose tractor with a six-row rotary hoe, shown at the left, is valuable in corn cultivation.

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peas, lespedeza, and grains such as milo maize, flax, and millet can be combined with success. The power take-off combine is a recent development and a new type of combine takes the form of a potato sacking attachment which hitches to the regular digger. Portable baling presses and improved grinders are also available. This outline is merely a suggestion of how the farm implement industry is meeting the needs of the mechanized farm. The ability of the manufacturer to meet needs with more diversified lines of better design and quality gives some insight of the progressiveness of this industry and the position it is taking at present and which it will take in the future business situation both in domestic and foreign trade.

Corn Growers Have Need for Machinery

ONE phase of this situation, the development of machinery for the use of the corn grower, is of transcending importance. There were in this country in 1929 98,000,000 acres cultivated in corn, whereas the wheat acreage was 61,000,000. Wheat once planted requires little attention until harvested, whereas corn, the acreage of which is far less mechanized than is the wheat acreage, must be cultivated a number of times during the growing season. Further, the corn picker offers great possibilities in the form of sales. It may be added that mechanization of cotton fields in the Southwest is well advanced and this move is destined to spread to the old South, where tradition and custom must give way.

Unrest and business depression throughout most of the world have had their effect on the farm implement business. Exports during the first 10 months of 1929 totaled $120,000,000, whereas in the corresponding period of 1930 the figure was $100,000,000. The Argentine, torn by political unrest, has offered rather a poor market, and low prices for most commodities in the world market have had adverse effect on sales in other directions. This situation is somewhat more aggravated than the figures show for the reason that Russia has been a consistent and heavy buyer in 1930. American farm machinery manufacturers exported $30,000,000 worth of tractors and heavy machinery to Russia in the first six months of 1930.

Outlook Is More Promising

AS viewed from most angles, the farm implement industry appears to have placed itself in a strategic position wherein it awaits only better general domestic and world trade conditions for full assertion of its place in the business world.

Production has been on a curtailed basis for some months, but the specifications for steel which some of the leading manufacturers have sent to the mills for January shipment indicate that their schedules will soon take an upward turn in preparation for the usual spring requirements.

Tractor plowing is becoming almost an essential in economical farm operation. (Above)

The combine plays an increasingly important part in low-cost production of wheat. (Below)





SHIPBUILDING HAS UNDERGONE SUBSTANTIAL REVIVAL

A SUBSTANTIAL revival of the American shipbuilding industry has developed during the past year under the stimulus of the mail-carrying and loan provisions of the Merchant Marine Act of 1928. While the volume of unfinished work is less at this time than a year ago, there are more men employed in shipyard work and more material is being used, the work at the beginning of 1930 having been largely in the preliminary stages.

Eighteen merchant ships of the passenger and combination type, eight tankers and two large yachts are now under construction. The aggregate tonnage of these 28 vessels is about 308,800 gross tons. In addition, six Government ships of a total displacement of 47,800 tons are now being built, these being three scout cruisers, one airplane carrier and two Coast Guard cutters.

Employees of 20 coastal shipyards, including all of the yards equipped to build seagoing vessels and including some men engaged on repair work in those seaboard yards that do both new construction and repair work, number 26,000, compared with 20,000 a year ago.

Industry Operating at 50 Per Cent

UNFINISHED work on hand in these shipyards totals in value about $90,000,000, compared with $120,000,000 a year ago. Of the present unfinished work, $65,000,000 is for privately owned ships and $25,000,000 for Government ships.

While the American shipbuilding industry is in a prosperous condition compared with its status of a few years ago, it is still engaged at no more than 50 per cent of capacity. There are 82 building ways in the United States available for ships of seagoing type, and of these less than half are occupied. New construction has been confined to the East Coast yards, although West Coast yards have 20 ways of sufficient size for large ships.

UNDER the stimulus of the loan and mail-carrying provisions of the Merchant Marine Act, American shipbuilding has had a fairly substantial revival in the past year, notwithstanding depressing influence of falling off in international trade. Thirty-three ships authorized under this program are still to be started, and, meanwhile, the Shipping Board is urging further aid for the American merchant marine so that it will eventually carry the greater part of United States commerce on the high seas.

The shipbuilding industry might have made further progress during the past year had it not been for the world-wide business depression. The falling off in both export and import trade has resulted in the laying up of large volumes of tonnage. At times during the past year fully 10 per cent of world shipping has been idle. With such a condition, it is not surprising that throughout 1930 there were no ships of the strictly cargo type under construction in American shipyards. Nineteen tankers are being built in foreign yards, however, for American companies. Several large yachts for prominent Americans are also being built abroad.

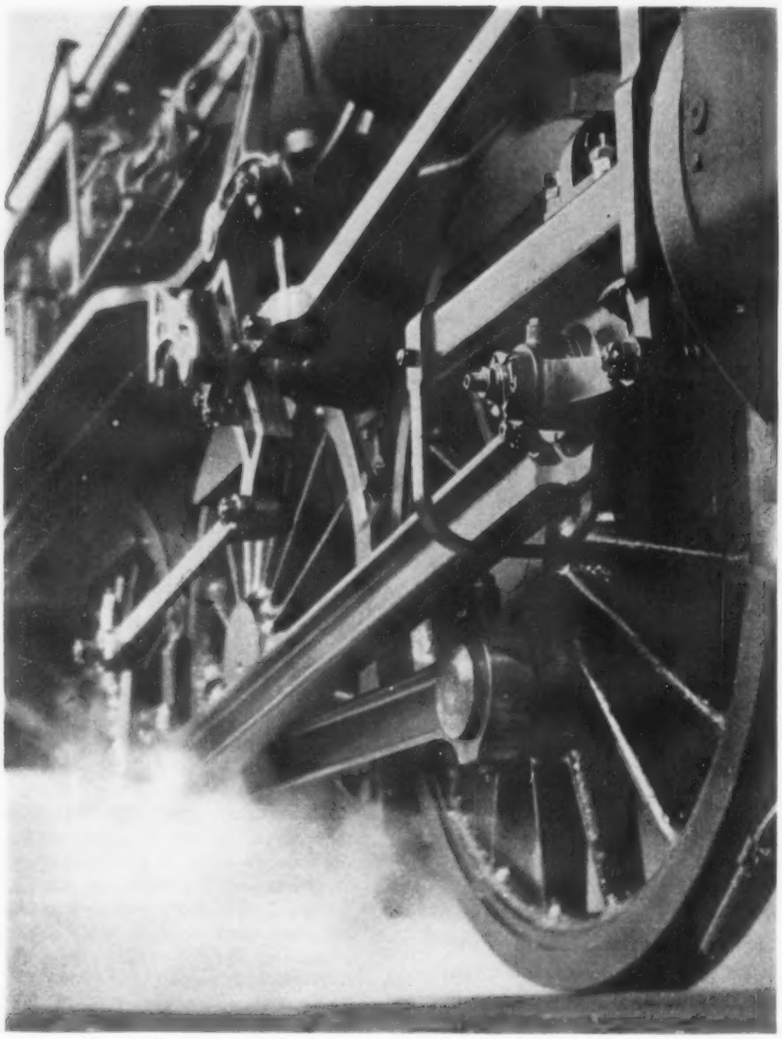
Ship repair work has shown a marked falling off, particularly in the late months of 1930, because of depressed international trade. On the Great Lakes new shipbuilding has been at low ebb. Two freighters and one tanker comprise the total deliveries in 1930 for Great Lakes service. One of the brightest spots has been the construction of river craft for carrying freight on inland rivers. The gross output of one yard that builds river barges in 1929 was larger than that of any other shipyards, and such yards were fairly active in 1930, with prospects good for 1931.

33 Ships Still to be Started Under Merchant Marine Act

OF the new ships definitely required to be built under the provisions of the mail contracts awarded by the Postmaster General, five have been delivered, 16 are now under construction and 33 are still to be built within the next few years. In addition, 36 ships now in operation are required to be reconditioned or replaced by new tonnage within the next few years. It is expected that the building of yachts, barges and miscellaneous small craft in 1931 will follow the general trend of business.

Government work promises to be

(*Concluded on page* 107)



RAILROAD

ADVERSELY affected by declining freight and passenger traffic, with consequent reduction of profits, and beset by the growing competition of waterways, oil and gas pipe lines, motor transportation and air travel, the railroads of the country were rather meager buyers of railroad equipment in 1930. The number of freight cars and locomotives installed in service was, however, fairly large, but was partly a carryover from 1929.

First Quarter Outlook Uncertain

Conditions which face the railroads have become more aggravated during the past six months than at any time in years, with the result that prospective equipment purchases are at a minimum and the outlook for at least the first quarter of 1931 for the equipment builders is uncertain at best.

As the Annual Review Number of THE IRON AGE was going to press a year ago, the Van Sweringen group of railroads was in the market for 130 locomotives, 11,350 freight cars and about 300 items of passenger equipment. No comparable volume of equipment business is in sight at the beginning of 1931, and, while a number of the railroads are understood to have fairly substantial equipment orders under consideration, it does not seem likely now that many orders of consequence will be placed until the first quarter is well on its way.

Railroad car and locomotive shops were fairly well occupied during the first six months of 1930, but since then work has been tapering off. In some plants there has been an almost complete cessation of work, while others are operating only part time with reduced forces. The recent orders of the Atchison, Topeka & Santa Fe for 1522 cars will help out temporarily the companies that received this business, but a large volume of orders is needed if the railroad equipment industry is to make in 1931 even as good a showing as in 1930.

45,346 Freight Cars Ordered, 75,169 Units Built

AN accompanying table gives in detail the figures on cars and locomotives ordered and built in the past year. Freight cars ordered for domestic service totaled only 45,346, compared with 111,218 in 1929. The 1930 record was the poorest since 1921, when orders totaled 23,346 units. Freight cars built for domestic service, however, totaled 75,169 units, against 82,240 in 1929. These figures include cars built in railroad companies' shops as well as in the shops of car companies.

Locomotives ordered in 1930

EQUIPMENT BUYING DECLINES

RAILROAD equipment buying declined in 1930 as railroads suffered from effects of business depression on freight and passenger traffic, aggravated by other forms of transportation competition, such as waterways, motor trucks and buses, natural gas lines and high-power electric lines, all of which have been eating into their business volume for some years.

Outlook for a large volume of railroad buying in near future is clouded not only by current decline in traffic demands, but by need for economic or other protection against further encroachments upon their revenues.

numbered 440 for domestic service, against 1212 in 1929, while 972 locomotives were built for United States lines, compared with 926 in the previous year. Passenger car business also was down to a marked extent, 665 units having been ordered, against 2303 in 1929, while 1262 were built for domestic service, compared with 1254 in 1929.

Only in two years since the war have the railroads bought fewer freight cars than in 1930—in 1919, when the total was 22,062, and in 1921, when 23,346 units were ordered. However, the 1928 total, at 51,200, was only moderately higher than the past year's total.

Total Capital Expenditures High in 1930

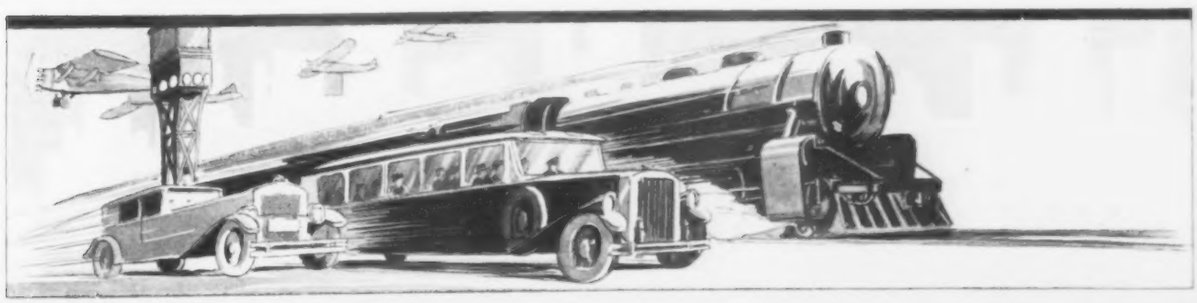
CAPITAL expenditures of the railroads for all purposes were very high in 1930, however, the actual outlay for the first nine months having been $698,821,000, an increase of $125,001,000 or approximately 22 per cent over the expenditures in the corresponding nine months of 1929 and an increase of $198,654,000, or 39.7 per cent over the like period of 1928, according to the official figures of the Association of Railway Executives.

General Improvement Program Fairly Large

In general improvements, such as bridges, maintenance of way, grade crossing elimination, stations and electrification, the railroad program for 1931 is fairly large, judging by projects which are pending, together with continuing work on projects already begun, but such improvements are in many instances dictated by necessity, while the railroads apparently do not require any large increase in rolling stock and motive power until such time as the traffic gains considerably.

Some roads, in planning their retirements of equipment far into the future, are likely to consider the possible savings in the rebuilding of old equipment rather than the purchase of new equipment. Railroad executives are said not to be of one mind on the economy of prolonging the life of cars by extensive repairs, but under existing conditions, which make it necessary for the carriers to stretch their capital outlays as far as possible, repair programs will be seriously considered during the next year at least.

WHILE recent tendencies in car construction have been toward the building of heavy, large-capacity units, especially for bulk products, such as coal, ore, pig iron and the like, the new competition which the railroads face from motor transportation in particular is focusing attention on the possibility of a reversion to light cars of small capacity for miscellaneous freight. As it is hazardous to place light cars in trainloads made up of large, sturdily built cars loaded with heavy bulk commodities, the tendency of railroad traffic in future may be toward express-freight trains car-



rying the lighter commodities, particularly where speed in transportation will be a factor in competing with motor trucks. As the average load per car is 26 tons, it is obvious that there are many car shipments which do not require cars of 50 to 70 tons capacity, which have predominated in equipment purchases of the past few years.

With a view to construction of smaller and lighter cars, railroads are studying the use of alloy steels, which will give greater strength with less weight, and also are considering welding in place of riveting.

Railroad Buying May Be Less Important Factor

A BELIEF is gaining ground that the railroads may be a less important factor during the next year or two in the purchase of steel and other commodities pending adjustments, legislative or otherwise, which will assure their economic future.

Even without considering the loss in traffic due to the business depression of 1930, the railroads have been undergoing for years a steady decline in the demands for their services. Railroad freight traffic increased at an average rate of 7 per cent a year for the 30 years ended with 1920, but in the nine years ended Dec. 31, 1929, the increase was only 1 per cent a year. Passenger traffic showed an annual increase of 6 per cent up to 1920, but in the following nine years there was an annual decrease of 3 per cent. In this nine-year period there was a gain of 181 per cent in passenger automobile registration and nearly 236 per cent gain in the number of motor trucks in operation, while motor buses carrying passengers increased from 10,000 in 1920 to 92,500 in 1929, a rise of 825 per cent. Intercoastal traffic through the Panama Canal increased from 1,372,388 tons in 1921 to 10,119,028 tons in 1929, or 637 per cent, while the amount of traffic moved over inland waterways (not including the Great Lakes) has grown from 83,152,182 tons in 1920 to 160,927,905 tons in 1929, or 93.5 per cent.

These are some of the important factors contributing to the decline in railroad earnings. In addition, coal traffic is being steadily reduced through the piping of natural gas to many consuming centers and the carrying of electric power over high-power lines, while oil pipe lines have for some years cut down the tank car distribution of oil by the railroads.

Many Remedies Proposed

RAILROAD executives have made a number of recommendations for protection of the railroads against this increasing competition. Among them are a respite from rate reductions and legislative efforts that will adversely affect rates; a withdrawal of governmental competition both through direct operation of transportation facilities as well as through subsidies; extending of the jurisdiction of the Interstate Commerce Commission over waterways and motor transportation and prohibition of discriminatory and unduly prejudicial rates; and opportunities for the railroads to engage in waterway and motor transportation without discrimination as compared with other agencies in the same field.

That all of the railroad problem is not encompassed in these competitive forms of transportation is the belief, however, of some of the authorities on railroad transportation. One such authority, Prof. William Z. Ripley, has declared that "today, as never before, it is necessary for the railroads to obtain the advantages of consolidation.

"With the strictest economy in 1930," he said, "they have been unable to earn anything like the fair return prescribed by law. It is apparent that means must be provided to make possible greater economies.

"Most of our railroads are operating upon a wasteful competitive rather than an economic basis. Every time that a car of freight is hauled over a longer route instead of a shorter one there is an economic loss. Yet competitive systems haul thousands of cars merely because they are competitive. The loss from 'empty mileage' alone runs into imposing figures. While no one wishes to bring about consolidations that would lessen competition, it is possible to effect consolidations that would be both competitive and economic."

Railroad Equipment Orders Declined in 1930

Statistics compiled by Railway Age on railroad equipment ordered and built in 1930 are as follows:

Equipment Ordered

Freight cars for domestic service	45,346
Freight cars for use in Canada	1,936
Freight cars for export	1,200
Total	48,482
Locomotives for domestic service	440
Locomotives for use in Canada	95
Locomotives for export	20
Total	555
Passenger cars for domestic service	665
Passenger cars for use in Canada	203
Passenger cars for export	15
Total	883

Equipment Built

Freight cars for domestic service	75,169
Freight cars for export	1,909
Freight cars built in Canada	6,923
Locomotives for domestic service	972
Locomotives for export	51
Locomotives built in Canada	111
Passenger cars for domestic service	1,262
Passenger cars for export	40
Passenger cars built in Canada	210

Orders for Freight Cars Since 1915

Year	Domestic	Canadian	Export	Total
1915	109,792	.....	18,222	128,014
1916	170,054	.....	35,314	205,368
1917	79,367	.....	53,191	132,558
1918	114,113	9,657	53,547	177,317
1919	22,062	3,837	3,994	29,893
1920	84,207	12,406	9,056	105,669
1921	23,346	30	4,982	28,358
1922	180,154	746	1,072	181,972
1923	94,471	8,685	396	105,552
1924	143,728	1,867	4,017	149,612
1925	92,816	642	2,138	95,596
1926	67,029	1,495	1,971	70,495
1927	72,006	2,133	646	74,785
1928	51,200	8,901	2,530	62,631
1929	111,218	9,899	3,023	124,120
1930	45,346	1,936	1,200	48,482

Prior to 1918, Canadian orders included in domestic.

PROGRESS OF BLAST FURNACE PRACTICE IN 1930



By RALPH H. SWEETSER

Consultant in Blast Furnace Practice, Columbus, Ohio

AT no time in the history of the iron blast furnace has there been so much progress made through research in the problems of the art of making pig iron as in the past year. For the past half century, the advances in blast furnace construction, operation and production have been a thousand fold in spite of the paucity of knowledge of the fundamentals of ferrous metallurgy.

It has generally been safe for chemists and physicists to formulate processes and theories for the production of commercial iron in such quantities and with such ease and low costs that the iron blast furnace would become obsolete. Some of these theories were so plausible that blast-furnace operators began to wonder if perhaps the scientists were not right. We saw the passing out of the copper blast furnace in favor of the gigantic reverberatory with its continuous feed over a system of miles of conveyor belts, crushers, grinders, pulverizers, concentrators, and roasters; and its almost continuous flow of copper matte and slag.

However, the more I have seen of the direct and semi-direct processes for obtaining the very common element iron from its union with oxygen, the greater is my respect and admiration for the iron blast furnace and for the art of smelting iron ores and iron-bearing by-products in a vertical furnace with solid fuel. This art is by no means perfected, and it now is more necessary than ever to continue the investigation of the interior of the iron blast furnace while in operation.

THE author pays his respects to the iron blast furnace as the smelter par excellence for iron ore and is not ready to extol any direct or semi-direct process of reduction.

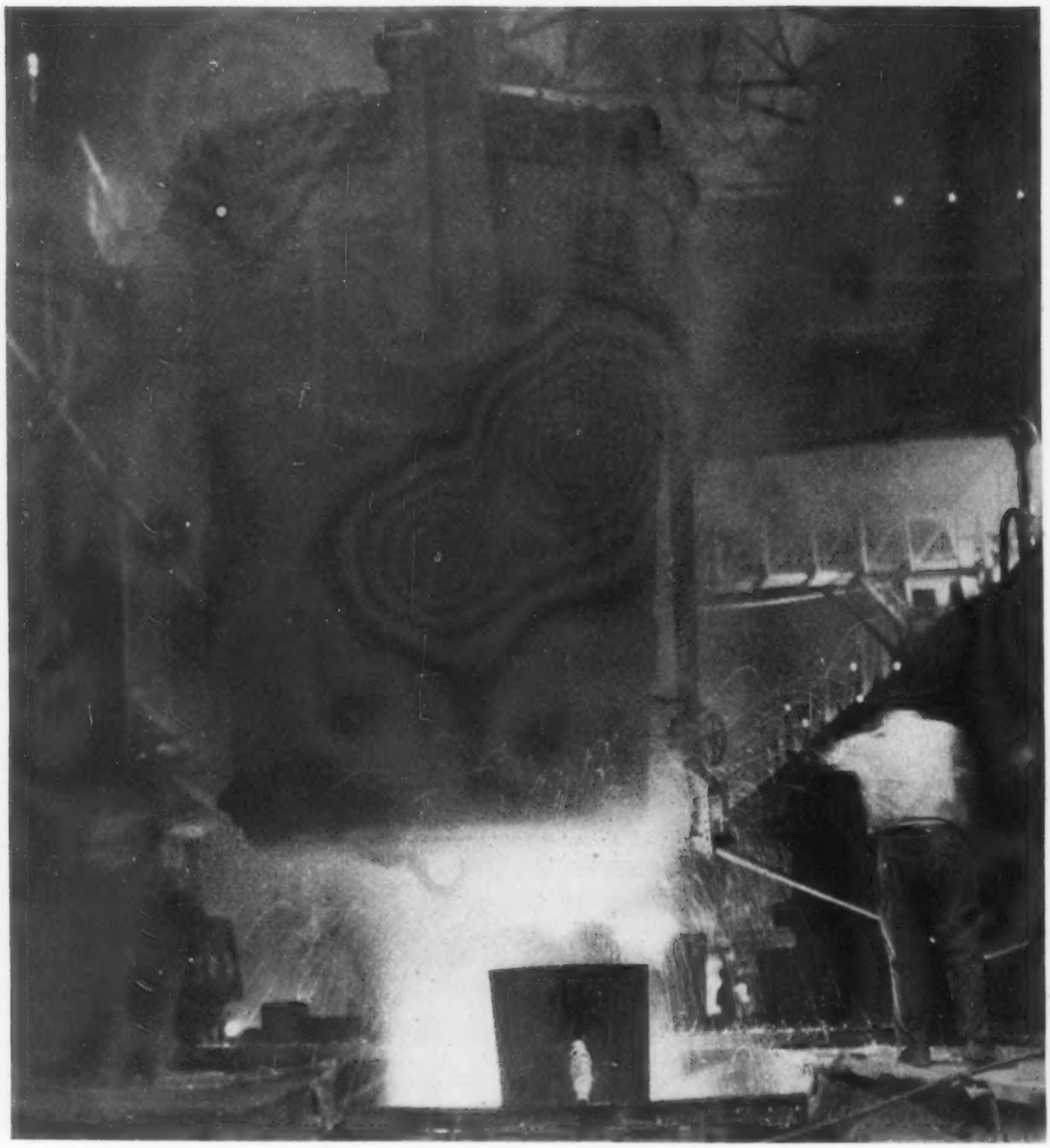
Incorrect theories and lack of the actual facts as to interior conditions and reactions have delayed progress in construction of blast furnaces and in the art of making pig iron. There is a striking example of this in the statement of George E. Rose, general superintendent of Wisconsin Steel Co., in his introduction to the paper on "The Modern Blast Furnace and Auxiliaries" at the meeting of the "Blast Furnace and Coke Association of the Chicago District," at its meeting in April, 1930. In speaking of the evolution of the profile of the blast furnace in the past 50 years, Mr. Rose said: "In other words, it looks as though improvement in blast-furnace design has been held back constantly in the previous 50 years by a fear of non-penetration at the tuyeres *if the hearth diameter became too great.*" Harry A. Strain, at the same meeting, spoke of the contradiction of the old "penetration" idea.

Research work of the U. S. Bureau of Mines by which the combustion zones in front of the tuyeres were discovered and explored brought to the art of iron smelting the facts regarding the reactions between the air-blast and the incandescent fuel. The knowledge of the extent of the combustion zone completely upsets the old "penetration" theory; but the erroneous idea of penetration of the blast has influenced every blast-furnace operator and numberless inventors for many years.

The upper zones of the furnace have been explored by the pioneers of the Bureau of Mines and of a few of the progressive steel companies; but there remains that most important zone between the tuyere level and the iron notch level where the secrets of the carbon in pig iron are still locked up.

Much attention is being given to the preparation of the raw materials for the blast furnaces, and

(*Concluded on page* 109)



Photograph by John P. Mudd for the Midvale Co.

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Eighty-ton ladle being teemed into a cast-iron mold, located in a concrete lined pit, to make part of a 424,000-lb. ingot.

▼ ▼ ▼

OPEN-HEARTH FURNACE DEVELOPMENTS IN 1930

COMBUSTION and its control and an enlarged use of fuels of low unit heating value are receiving more and more attention from steel makers. Mechanical equipment has been improvised to care for larger output from existing furnaces.

CONTINUING and more intensive attention to combustion of fuels, together with automatic control of the furnace operations, has marked in large measure the progress of open-hearth furnace practice in the United States this past year. Probably twice as many installations of automatic devices for control of furnaces are in use today as was the case a year ago. At the same time there has been development along the line of using a mixture of gases or other fuels, which has carried this practice far beyond that previously attained.

In many cases where mixed gases are used, reliance is still placed upon manual operation—reversing the direction of flow of the fuel upon the basis of the operator's own estimate of conditions within the laboratory. Even here, however, there is a growing use of instruments and other devices for assisting the operator to determine conditions within the furnace more accurately than he can do with his eye alone.

Much study has been applied to the mixture of fuels, both gaseous and liquid. In particular, attempts are being made (and with a large measure of success) to make use of the leaner fuels, such as blast furnace gas, etc., for metallurgical purposes. By mixing these fuels with those richer than is entirely necessary for the open-hearth process, the temperatures required in the laboratory may be maintained—provided always there is suitable regeneration.

Development in Mechanical Features

THERE appear to be no startling developments during the year, but merely a progression along lines which a year ago were already well explored. There have been trials, however, of an extension of insulation from the regenerators and front and back walls to such parts of the furnace as the roof. While these experiments have not been thoroughly conclusive, they have given enough evidence of value to make it worth while to continue them. They are taking two or three forms, such as insulating brick laid directly on the roof brick, granular insulating material poured between the ribs and the use of long insulating brick laid across from rib to rib, leaving an air space between ribs of perhaps 4 in. in thickness.

There is no stopping of the trend in making larger and larger units. Furnaces are being increased in size through the expedient of building them up around the door plates, and in some cases through actual lengthening, when major repairs are needed. It has been found—and pretty conclusively—that these larger furnaces will give as good steel qualities as their smaller fellows, and that they can be operated more cheaply, output for output, as the size goes up.

Attendant problems, such as the size of ladles and ladle cranes, are being met in various ways. If the cranes will not take the added weight, then the steel is tapped into two ladles, through a bifurcated spout and handled in that manner. If the ladle of circular section is inadequate, an elliptical section is adopted, permitting the same crane ladle hooks to pick up the enlarged unit. In designing new plants, of course, these expedients are not resorted to, but they do offer much flexibility in the present program of expanding existing plants at low capital expenditure.



STEEL MILL ELECTRIFICATION MAKES MARKED PROGRESS

THE steel industry was especially active in electric development during the past year. In a résumé of the outstanding activities of the electrical companies, A. W. Robertson, chairman of the board, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., states that "notable improvements were made in the huge motors for driving reversing mills; the use of automatic control was extended; electric steel furnaces were designed in larger sizes and for higher temperatures; and practically all of the large steel companies producing pipe or structural steel have begun to employ electric arc welding on a large scale."

In the field of electrical equipment for steel mills, R. H. Wright, steel mill engineer of the Westinghouse company, calls attention to the fact that the development in 1929 of the twin-motor drive for main rolls has made it possible to increase greatly the amount of power which can be applied to a single-stand mill. One 10,000-hp. drive of this type, having a maximum torque of 3,900,000 lb.-ft., was placed in operation in the Chicago district in 1930.

And it was felt, says Mr. Wright, that this drive might hold the record for power applied to a single stand for some time, but the increasing requirements for mill power have resulted in an order for a slabbing mill drive, now under construction, which will have a continuous capacity of 12,500 hp. This drive consists of a 10,000-hp. 40/80-r.p.m. reversing twin motor for the horizontal rolls and a 2500-hp. 79/225-r.p.m. reversing motor for the vertical rolls. These motors will receive d.c. power through a 10,500 kw. flywheel motor-generator, which is larger than any previous motor used for reversing mill service.



Plate Mill Has Automatic Screwdown

A STRIKING illustration of how the most modern electrical devices are being freely used to secure improved mill operation is furnished by a three-high 32-in. universal plate mill which went into operation recently at the plant of the Gulf States Steel Co., Alabama City, Ala. This mill is designed to roll thin plates for a sheet mill and has been equipped with variable voltage automatic screwdown control to give uniform and accurate pass settings with minimum time between passes. The table list has been designed to operate at the highest possible speed. The main drive is a 4000-hp., 80/160-r.p.m., adjustable-speed d.c. motor controlled from the mill pulpit. It is the first plate mill, according to the Westinghouse company, to have an automatic screwdown and the first rolling mill to have variable voltage screwdown drive. Because of these special features, this mill has been able to roll sheared plates 3/16 in. thick and 72 in. wide, and on universal plate it is expected that ⅛ in. x 30 in. can be obtained.

By means of the automatic screwdown control on the universal plate mill, the rolling schedule may be predetermined and settings selected for each pass. These desired settings are selected by a plug in selector panel on the back of the limit switch. After each pass the operator merely moves a 15-point master switch to the next position, and the screwdown automatically moves up and stops accurately at the selected position. The automatic control with variable-voltage operation requires less attention of the operator, it is pointed out, and, together with other special features on the mill, speeds up the operation, thus increasing the output of the mill and enabling lighter gages to be rolled because of being finished before the temperature has dropped too low.

Photoelectric Tube Control of Soaking Pit Covers

A NEW beam mill placed in operation late in 1930 uses six automatic screwdown controls of new design. In another installation by the Westinghouse company photo-electric tubes have been utilized to operate soaking pit covers from the pit cranes without wire connections between the crane cabs and the cover control panels. These installations indicate the increasing faith in modern electrical devices which would have been classified as impractical a few years ago.

The control for the soaking pit covers consists of light sensitive tubes mounted along a crane runway opposite each soaking pit and spot lights mounted on the crane cab. When the crane is over any row of soaking pits, the crane operator may energize the proper light sensitive tube, thus causing the tube to actuate suitable relays to control a motor to open or close the soaking pit covers. This control is, of course, additional to the regular floor control master switches, so that the covers may be operated either by the crane operator or by the soaking pit operators on the floor.

Photo-electric tubes are, in fact, destined to find their way more and more into steel plant operations. For example, the General Electric

NOT the least interesting development in the electrification of steel mills in the past year has been the adoption of the photoelectric tube. It has been used, for example, to control the opening and closing of soaking pit covers and for the automatic control of operations on pipe facing machines and for controlling the tension of wire between the die and the reel in wire drawing machines.

This and other developments, such as the automatic screwdown control of rolling passes, suggest that the operation of an entirely automatic steel mill is a future possibility.



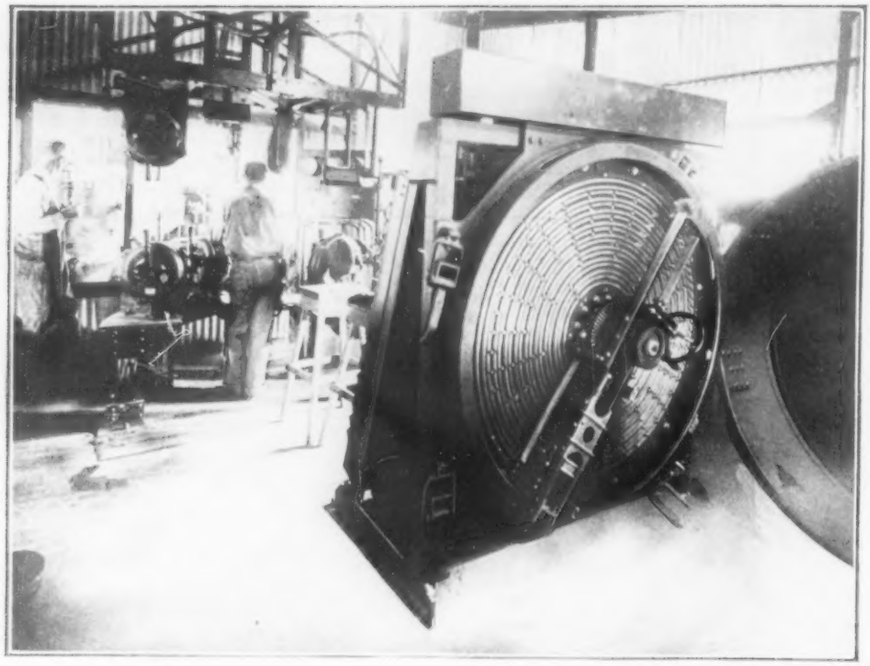
Co. is responsible for the successful use of such tubes on a pipe-facing machine in a large tube mill. Each facing machine has two movable cutting heads. When a length of pipe is clamped in position in the machine, these two heads must advance to within ¼ in. of the end of the pipe and stop there. The heads are motor-driven. Obviously, any type of mechanically operated limit switch mounted on the head and actuated by contact with the end of the pipe was out of the question, as the switch would be in the way of the cutting tool after the head was brought to a stop. Consequently, photo-electric tubes were used, a tube and a light source having been mounted on each cutting head in such a way that, as the head approaches the pipe, the end of the pipe intercepts the beam of light between the source and the photo-electric tube. Shutting off the light de-energizes the tube, which in turn causes the control equipment to stop the travel motor when the head is ¼ in. from the pipe.

Another type of vacuum tube, called the thyratron, has been found useful in steel mills. This is a rectifying tube, the d.c. output voltage of which can be controlled by adjusting the potential on its grids. The thyratron is in use on wire-drawing machines to control the tension in the wire between the die and the motor-driven reel. The application was described and illustrated in some detail in THE IRON AGE of Dec. 4, 1930.

Vertical Motors Direct-Connected to Edging Rolls

A TEN-INCH continuous bar mill now under construction for a mill in the Youngstown district will use two 800-hp. adjustable-speed vertical motors for driving two vertical edging stands. This is the first installation, the Westinghouse company states, where vertical motors of such high capacity have been so used. The use of a vertical motor for an edging stand eliminates the bevel gearing required with horizontal motor drive and makes it possible to increase the amount of power which can be applied to a stand of vertical rolls. The pinions and motors are mounted above the mill and are direct connected.

One of the outstanding new installations of the year is the new plant of the A. M. Byers Co. for the production of wrought iron on a large scale, using the Aston process which eliminates hand puddling. This plant is electrically operated throughout. The most novel piece of equipment in the plant is the electric ingot press, which compresses the 6000-lb. masses of iron to ingots suitable for rolling on the blooming mill. This is said to be the first press to have electric motors directly connected to the rams. The motor for the main ram is rated at 1200 hp. and the end press is driven by a 325-hp. motor. The characteristics of the motors and



BY means of an automatic screwdown on a new universal 32-in. plate mill of the Gulf States Steel Co., the rolling schedule may be predetermined and settings selected for each pass. These desired settings are selected by a plug in selector panel on the back of the limit switch. After each pass, the operator merely moves a 15-point master switch to the next position, and the screwdown automatically moves and stops accurately at the selected position.

control are such that the press operates with the smoothness and safety of a hydraulic press.

In the galvanizing departments of steel plants a new development of the year was the installation of three machines in which complicated gearing has been eliminated by the use of a synchronized electric drive, applied for the first time for this type of service. The conventional galvanizing machine drive consists of a single adjustable-speed motor, which drives both the entrance rolls and exit rolls through gearing. With this old arrangement, when the rolls become worn and are reground, it is necessary to change gears to secure correct speed relations between the entrance rolls and the exit rolls, and the rolls must be ground to suit the speed ratios obtained with the change gears. In the new drive the entrance rolls and exit rolls are independently driven by adjustable speed motors, which are kept in synchronism by special control, and the gearing is eliminated. The ratio of the motor speeds can be varied in very fine increments over a considerable range, so that rolls of any diameter within the working range can be operated together without regard to the ratio of their diameters. These galvanizing machines are used in the manufacture of galvanized sheets.

There have been important developments during the year in the perfecting of new processes for the electric welding of pipe. The National Tube Co. and the Youngstown Sheet & Tube Co. have installed equipment for such work.

Synchronous Motor Has Largely Superseded Induction Motor

THE General Electric Co. notes that the synchronous motor has very largely superseded the induction motor for constant-speed mill drives, except of course where flywheels are necessary. This development has come rapidly, considering that the first really large synchronous motor in steel mill main roll service, a 9000-hp. unit, was installed as recently as 1925 in the plant of the Corrigan-McKinney Steel Co. at Cleveland.

Among the more important installations of synchronous motors during the past year were two 4500 - hp., 156.5 - r.p.m., 6600 - volt, 60-cycle units for driving two rod mills at the plant of the American Steel & Wire Co. at Donora, Pa.; also a 5000-hp., 360-r.p.m., 6600-volt motor to drive a 24-in. billet mill and a 4000-hp., 360-r.p.m., 6600-volt unit to drive an 18-in. billet mill at the same plant. This company also installed at its Newburgh Works at Cleveland a 3000-hp., 100-r.p.m., 11,000-volt, 3-phase, 60-cycle synchronous motor to drive a three-high billet mill, one of the few main mill motors operating at over 6600 volts. An interesting feature also is that it is started from rest by connecting directly to the 11,000-volt circuit.

What is believed to be the first installation of synchronous motors on hot tin mills has been made at the Clarksburg, W. Va., plant of the Weirton Steel Co. Two motors, one 2000-hp., 300-r.p.m., and the other 1000-hp., 360-r.p.m., are being used. Synchronous motors were chosen for this operation because of the necessity of maintaining a good power factor in order to earn a low rate on the purchased power and also because of the gain in efficiency. It is expected that the power per ton of tin plate rolled will be at least 5 to 10 per cent less than if an induction motor flywheel drive had been used. As there are no flywheels on the drive, the motors must carry the maximum peak loads of the mill, and therefore the continuous capacities of the motors were made about 25 per cent greater than they would have been had induction motors been used. The synchronous motors will develop 250 per cent of normal torque with normal field excitation, and in case the load exceeds this value a relay will automatically strengthen the field enough to permit the motor to develop 300 per cent of normal torque without pulling out of stop.

Motor of Fabricated Steel Construction

An 8000-hp., 40-100-r.p.m. reversing motor is now being built by the General Electric Co. to drive a 44-in. blooming mill at the Gary Works of the Illinois Steel Co. This motor will be capable of

developing a maximum torque of 2,900,000 lb. at 1 ft. radius. The mechanical parts of this motor, including the armature spider, will be of fabricated steel construction throughout, a method of manufacture that has been demonstrated to be reliable, as several General Electric motors of this type have been in service for some time.

The Illinois Steel Co. is also installing at its South Chicago Works a 10-in. alloy bar mill, to be driven by nine d.c. motors totaling 7627 hp. Some of these motors have a speed range of approximately 5:1, which is obtained partly by motor field adjustments and partly by armature voltage control through the use of auxiliary bucking generators, one for each of the two motors which have this large speed range. The use of these bucking generators permits operating the three main 1750-kw., 600-volt generators in parallel at constant bus voltage. The motors will be equipped throughout with speed regulators of the vibrating type, designed to hold the speed regulation within very close limits.

Automatic Control of Speed on Hot Strip Mill

THE 20-in. continuous hot strip mill of the Great Lakes Steel Corpn., Detroit, which was put into operation recently, has 10 stands, each driven by an individual d.c. motor. The drive for this mill has one very interesting feature. When rolling from slabs of such lengths that the piece will reach from stand 4 to stand 5, the section of bus to which the first four motors and 1-5000-kw. generator set are connected, is segregated from the bus to which the remainder of the motors and the other motor generators are connected. This is necessary because the minimum speeds of the first four motors, when operating at normal rated voltage, are such that the metal would be delivered from stand 4 at a very much higher speed than it enters stand 5. Consequently, when the piece is continuous between stands 4 and 5, the speeds of the first four stands must be lowered by reducing the voltage of the generators on the section of bus to which the first four motors are connected.

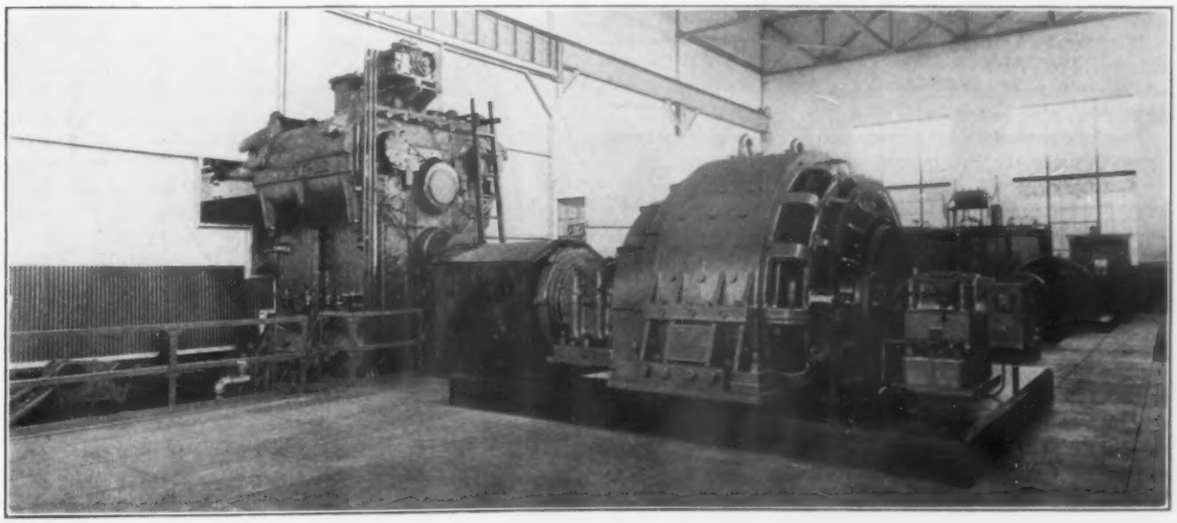
However, to reduce the total time required for a slab to go through the mill when rolling on a schedule of this nature, the first four motors operate at full voltage whenever there is no steel in the space between stands 4 and 5. That is, a slab enters stand 1 at a comparatively high rate of speed and passes on through stands 2, 3 and 4. When the front end of the piece gets a little distance out of stand 4, it strikes a limit switch, which causes the voltage and speed of the first four motors to be reduced to a point such that the delivery speed of stand 4 corresponds to the entrance speed of stand 5. Then, when the tail end of the strip leaves stand 4 and passes beyond the limit switch, the voltage and speed of the first four motors is automatically brought back to the normal value. This arrangement permits of a considerable saving in time in the rolling of long slabs without necessitating a long spacing between stands 4 and 5. A similar arrangement was incorporated in the control of the first two motors on the 60-in. wide strip mill in the Wheeling Steel Corpn., Steubenville, Ohio, plant.

Maintaining Torsion in Rolling of Cold Strip

DURING the past year there has been considerable activity in connection with cold strip mills and Steckel mills. The Steckel mill is a type of cold-rolling mill in which the metal is drawn back and forth through the main rolls by motor-driven reels, one located at each side of the main roll. The rolls themselves are not driven. On the majority of the mills so far installed a single motor is used, this being connected alternately to the two reels through clutches.

However, the Weirton Steel Co. is now putting into operation a mill of this type in which each reel is driven by an individual 500-hp., d.c. motor. As it is necessary to maintain a certain amount of tension in the strip between the mill and the trailing reel, the motor on the trailing reel acts as a generator in order to maintain this tension and an automatic regulator provides for maintaining the tension at any desired value. In passing from the reel to the mill, the strip rides over a floating roller which, through a system of levers and pivots, is connected to the contact arm of a regulator and to a scale beam having a sliding weight.

(*Continued on page* 80)



A 32-IN. universal plate mill installed by the Gulf States Steel Co. has automatic screwdown control and variable voltage screwdown drive. The table lift has been designed to operate at the highest possible speed.

CARBIDE DIES ADVANCING THE ART OF WIRE DRAWING

By L. D. GRANGER
Wickwire Spencer Steel Co., New York

THE advantages — and the limitations — of drawing wire in diamond dies have long been known. They have been used for fairly large sizes of non-ferrous metals for many years, but the cost and brittle nature of the material have prevented extension to the field of the medium sizes of ferrous metals. Steel in sizes 0.016 in. and finer is frequently drawn in diamonds, but coarser than this we have still been forced to depend upon the chrome-tungsten die steels for the range between the diamond and the effective field of the shank plate or the cast-iron die.

With the introduction of continuous wire drawing for coarser gages the need was felt for dies that would last longer. One feature that retarded the adoption of these machines was die failure in the intermediate drafts with consequent charge in the reductions, thus throwing the carefully planned gear ratios out of balance, and resulting in continual breakage.

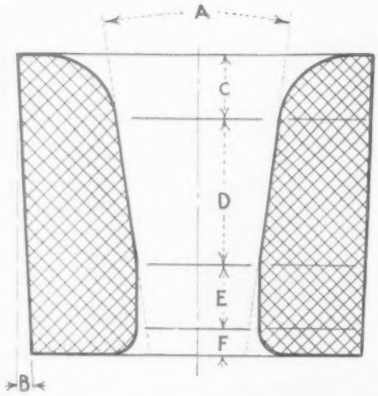
It seems to be the habit in this old world of ours, however, that whenever a need arises, our inexhaustible storehouse of almost miraculous materials affords something to solve the problem. Here, an entirely new substance appeared with properties so unusual and remarkable that at first they seemed almost beyond belief.

A few years of experiment and research have, however, demonstrated beyond doubt the efficiency of the material, and now, thanks to the careful study of angles, bearings, reductions, and lubrication, one more step has been taken toward the reduction of wire drawing to an exact science, and one more item of mystery has given way to a definite and almost mathematical certainty.

Carbide Die Has Longer Life

We are now told that a die may be depended upon to draw hundreds of thousands of pounds of wire on size instead of two hundred, that the finish of the wire will be improved, and that less power is required. Naturally the first question the sceptical man will ask is about the cost of all this.

Practical experience has perhaps not as yet answered the question for all types of drawing. The life of a steel die is uncertain—you will still find among the cherished possessions of an old-time artisan, dies ten to 20 years old, carefully secreted and guarded for use in holding the occasional piece of wire that cuts out every other die. At other times, dies will be spoiled by too long service and too many resettings between annealings, and will crack. Thus, it becomes an almost indeterminate factor in the cost of drawing in these dies.



Cross-section of tungsten-carbide die nib showing features to be observed. A is the included angle; B, the side taper; C, the mouth of die; D, the straight conical approach; E, the land or bearing; and F, the relief at back.

On the other hand, it is just as difficult to evaluate the life of a carbide die. One mill may draw many decimal sizes close together, and thus be able to utilize more steps in the polishing out process from the original size to that at which it must be discarded. Possibly a sort of die exchange will be established by some enterprising manufacturer through which every die will be sure of the maximum number of repolishings.

Mills Studying Overall Economy of Carbide Dies

Careful records are being kept in many mills of the tonnage or footage of wire drawn in carbide dies, the cost of repolishing, the interest on the investment—which is a much more important factor than in steel dies—and, as a result, in due time definite figures will be available over the entire range which will settle beyond doubt the relative values of the materials.

It is possible, however, that other considerations may outweigh a possible greater cost per ton of wire drawn in carbide dies. The first claim is that with the proper angle of approach in the die and the use of the proper lubricants, a saving of as much as 30 per cent of the power required to draw through steel dies is made. We are not as yet entirely sure whether this is wholly due to the die material or not, but it is very evident how important a factor this might prove to be.

Another claim is that the rejections in the mill are greatly reduced. The lower pull necessary

INTRODUCTION of continuous wire drawing for the coarser gages brought the need for dies that would last longer. Application of tungsten carbide in this field, with careful study of angles, bearings, reduction and lubrication, appears to have solved the problem and to have made wire drawing a more exact process. Processing of extremely heavy bundles, made by welding several coils together, has been made possible with the certainty that the advantage would not be lost by continual stopping to replace a cut out die.

Advantages include increased production, lower power costs and reduction in mill rejections. To secure these, however, the carbide dies must be of suitable grade or mixture, of proper shape and have sufficient material to withstand the stresses without breakage. Lubrication must be of suitable character, and automatic grinding and lapping equipment must be available to assure duplication of the proper approach angle and length of bearing and approach.

to effect the draft naturally results in less pulling down in size of the wire between the die and the block, and therefore the "sucking-up" often laid to this cause is reduced. Records exist in many mills of many thousands of pounds of wire drawn through carbide dies with almost negligable variations in gage from one bundle to another. Off-size wire has practically disappeared in many mills.

Carbide Die Not a Cure-All

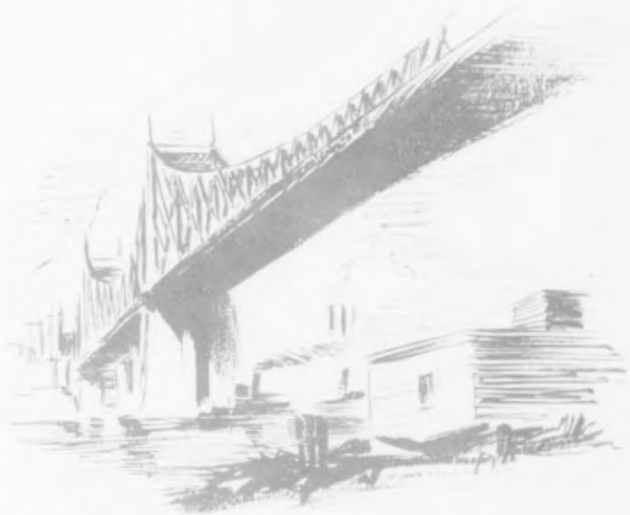
We must not think however that a carbide die is a panacea for all evils. It is just as necessary to clean, coat and prepare wire properly for carbide dies as for steel. Dirty wire will scratch and behave as badly in carbide dies as in a steel die. Carbide dies rather put a premium on good preparation, as the wire drawer becomes accustomed to considering that the die ought to last a long time, and objects more strenuously than ever if his wire gives trouble.

Production is ever a matter of concern to the foreman. It is evident that the more time a wire-drawer draws wire, or, to put it conversely, the less time he is obliged to fool around on non-productive jobs, the greater will be his output. Instances are on record where the production per man has increased as much as 25 per cent with carbide dies carefully made for him, and properly designed for the job. The processing of extremely heavy bundles of rods made by welding several coils together has been made possible with the certainty that the advantage would not be lost by continual stopping to replace a cut-out die. The carbide die has been an important factor in the further development of the continuous rod drawing process; formerly the maximum length of bundle has been limited by failure of the die and the consequent loss of efficiency which brought the overall production to a figure not sufficiently superior to the old frame to justify any large expenditures for new equipment.

Grade and Amount of Material, Design and Lubrication Important

To obtain all these features carbide dies must be made of the proper mixture, of the proper shape, and with sufficient material to withstand the stresses without breakage. Furthermore, the lubrication must be of the proper character, and, above all, when these conditions have been established, they must be susceptible of duplication to a mathematical degree of certainty. This has led to an exhaustive research on methods of automatically and mechanically grinding and lapping which will insure that every die made will have the proper approach angle, the proper length of bearing and approach, and that these features may be provided without the expertness and skill previously required of the die polisher. We are assured by several manufacturers that all of these are now possible, and that this rather troublesome procedure has been so simplified that it need have no terror for any wire mill.

We feel that these dies have opened a field to the progressive operator that is almost limitless for planning increases in production, and that in the near future as great advances in the art of wire drawing are as possible as are those which have occurred in other steel-making lines. Perhaps at last wire drawing is on the threshold of becoming modern.



MOVEMENTS IN METALLURGY AND HEAT TREATMENT

By DR. GEORGE B. WATERHOUSE

Professor of Metallurgy, Massachusetts Institute of Technology
and Consulting Engineer and Metallurgist

1930 was notable for a number of developments in iron and steel metallurgy, and attention may be drawn to a few of them.

In blast furnace practice, more installations were made of large hearth furnaces, and increasing attention was paid to the proper preparation of the charge, with good results in improved quality, larger outputs and lower costs. The value of sintering fines has become more apparent, and many furnaces have used a large percentage of sinter in their burden with splendid results.

Greater Use of Clean Blast Furnace Gas

Also better methods of gas cleaning have been applied, and the value of clean gas has become more evident. The availability of such gas has led to a number of improved designs of stoves and to the use of higher blast temperatures, so that a large number of furnaces are now operating with blast from 1400 to 1500 deg. Fahr., and with only three stoves.

This is in line with the great attention paid to fuel economy throughout the industry, and the increasing recognition that clean blast furnace gas is a splendid fuel for steel plant use. Costly installations were made at a number of plants to pipe the excess gas around the works, and it is being used as never before for soaking pit and reheating furnaces, for heating coke ovens and open-hearth furnaces, either alone or when mixed with coke oven gas.

One large plate mill, to be finished in the near future, will use blast furnace gas alone in the slab reheating furnaces, these furnaces being designed with such efficient regenerators that cold slabs can be rapidly raised to rolling temperatures even with a fuel so low in B.t.u. value.

Automatic Control of Open-Hearths

In steel making practice there has been a remarkable application of automatic control devices for open-hearth furnaces and, partly because of this, some amazing fuel economies have been obtained. It is not unusual now to hear of furnaces making steel with an equivalent coal consumption of 300 lb. per ton of ingots.

Insulation of furnaces and furnace structures has been carried out and many experiments made with various designs of ports. Large stationary furnaces have increased in number, and one plant in the Pittsburgh district is building tilting furnaces in order to carry out the duplex process.

High-Frequency Furnaces of 3½ Tons

A striking development in the electric furnace field has been the increase in installations and capacity of the high-frequency or coreless induction furnaces. One has just been put in operation near Boston, melting heats of 2¼ tons, and two are being constructed for a Western plant which will melt 3½-ton heats. There is world-wide interest in this type of furnace and, in this connection, very interesting experimental work is being carried out by a Pittsburgh concern with a low-frequency, 60-cycle furnace melting 2-ton heats, but with a capacity approaching 4 tons.



Rustless Steel by a Cheaper Process

There is not space to speak of the many developments in the field of alloy steels, but progress has continued particularly in regard

MANY installations have been made of high frequency induction furnaces, some of them up to 3½ and 4 tons capacity.

One plant has prosecuted a method for making high-chromium, 18 and 8 and other rustless steels by a cheaper process.

Method developed for heat treating standard steel rails has large promise of success.

Heat-treating furnaces monumental in size and automatically controlled within very close limits have been built.



to the manufacture and use of the non-corrosive and heat-resisting steels. One plant in New York State has actively prosecuted a method for manufacturing high-chromium, 18 and 8, and similar steels which gives promise of notably reducing costs.

Heat-Treated Rails Further Developed

There have been notable developments in the field of heat treatment. After very costly experimental work, a method has been developed by the Bethlehem Steel Co. for the heat treatment of standard length rails. It has not been described in the technical press, but has been shown to visitors and in particular to delegations of railroad engineers and maintenance-of-way men. Trial lots of these rails have been in track on various roads for some time and are giving excellent results.

Notable Progress in Heat-Treating Furnaces

The advance in heat treatment has been most marked in regard to furnace design and temperature control. Electricity, gas and oil are being used for heating with splendid results. Some of the furnaces are monumental in size and automatically controlled within very close limits.

Nowhere has progress been more marked than in the sheet industry, where not only the normalizing and annealing furnaces but also the heating furnaces are worthy of mention. One factor leading to the success obtained has been the liberal use of heat-resisting, non-scaling alloys.

Large Number of High-Grade Technical Papers

Finally, in looking back over 1930, mention must be made of the amazing amount of technical papers and articles presented before the professional societies or published in the weekly or monthly magazines. They have not only been large in amount but excellent in quality, and give promise for continued growth and development of our industry during 1931 and the coming years.

Prospects for American Foreign Trade

BY O. K. DAVIS

Secretary, National Foreign Trade Council

FOR the first time in seven years our exports have fallen below the four billion mark. The figures for the year 1930 will be close to that amount, while our imports will be a little over three billion dollars, our lowest total since 1922.

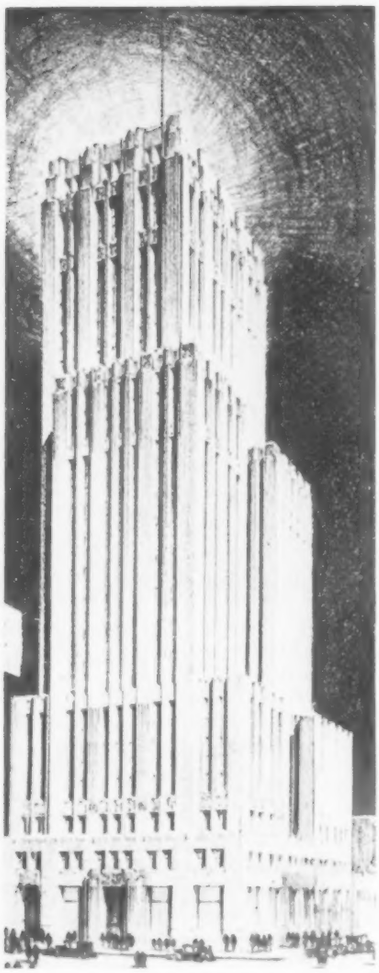
That is not the whole story, however. In quantity of goods entering into our foreign trade we have done approximately as much business during the past year as we did in 1926. Our foreign trade has had a real value for the year 33 1/3 per cent greater, with adjustments to standard prices, than it had in 1913. That still represents a substantial gain over our pre-war position.

American Practice the International Standard of Excellence

In the last 15 or 20 years American producers and traders have made a very considerable advance in the art and science of merchandising in other markets. Whereas, 20 years ago our foreign trade practice was a joke to the rest of the world, it is now, even in the midst of the present restricted markets, better organized and better conducted than that of any other nation. It is, in fact, the standard of excellence in international commerce.

In looking forward to 1931, American foreign traders are analyzing their markets carefully and are preparing for the increased volume of business that is sure to develop. The resources of our credit, as shown in the development of American foreign banking branches, on the one hand, and of the systems initiated by credit departments of our large manufacturers, on the other, have been developed to a very high point of efficiency. Our services of transportation and communication are better than ever before. Our export departments are better trained and are more at home in foreign trade. In short, we possess advantages over our position in the corresponding slump in 1921 that are the result of nine years' hard work.

INCREASING NUMBER OF STEEL STRUCTURES WELDED



The arc welding of the steel frame of this 22-story office building of the Dallas Gas Co., Dallas, Texas, consisted of 20 per cent of the shop fabrication and 100 per cent of the field fabrication.

WITH the erection of four large office buildings and an increasingly large number of smaller ones of various kinds, that were either partly or entirely arc welded, arc welding of steel structures continued to fulfill the prophecy of 1928 and 1929, says L. D. Meeker, industrial department, General Electric Co., in a summary of some achievements in arc welding during 1930.

The new headquarters of the Southern California Edison Co., started the latter part of 1929, is a 13-story structure approximately 150 ft. in height, and with a ground floor plan of 180 x 180 ft. The 3500 tons of steel required was both riveted and arc welded, the welds totaling nearly 50,000 ft. Vertical loads were carried by rivets, but all seismic and wind bracing was welded, requiring elaborate designs in some cases. The Consolidated Steel Co., Los Angeles, was both the general contractor and the steel erector.

Close on the heels of this came the 14-story building of the Edison Electric Illuminating Co., Boston, occuping ground area of approximately 58 x 110 ft. Because of the height and the narrow width, some interesting problems were solved in wind bracing. In order to take advantage of standard shop practice, thus encouraging the maximum number of bidders and assuring minimum cost, the steel was shop riveted. Due to the location of the building in a district of fashionable and exclusive shops, as well as surrounding office buildings, the Edison company decided to eliminate as much construction noise as possible and to erect the steel by arc welding. Elaborate ceremonies marked the start of actual erection, Mayor Curley making the first weld. Of the 1314 tons of steel, 1050 tons was framed together by welding. The welding, begun April 28, and completed June 27, 1930, required a total of 1205½ man hours. The total length of welds was 60,514 in.; approximately 2600 gross pounds of electrode was used. The engineers were the Whidden-Beekman Engineering Co. and the steel erector was the Daniel Marr & Son Co., under whose direction the welding was done by Leake & Nelson, Bridgeport, Conn.

Simultaneously the Dupont company added a 14-story addition to its main office building at Wilmington. This was arc welded without disturbance to the occupants of offices in the original building.

19-Story Welded Office Building Nearing Completion

But the distinction of erecting the tallest all-welded building, says Mr. Meeker, was to go to the

Dallas Power & Light Co., whose 19-story shop and field arc-welded office building is now nearing completion. The Dallas Gas Co. is also arc welding its new office building.

The Dallas Power & Light structure contains 1300 tons of steel, is 246 ft. above the foundations and has a ground floor plan 100 x 100 ft. Welding was started July 23 and completed Sept. 20, 1930. Five welders at most were employed. The Mosher Steel & Machinery Co. furnished and erected the steelwork, including the welding. F. P. McKibben, associated with Carson & Carson, Philadelphia, was consulting engineer on welding.

A fact worthy of note in connection with these jobs is the small number of welders and welding machines required, states Mr. Meeker. On the Boston building, three welders did most of the work with a fourth added later. On the Dallas building, four machines were used.

Other welded steel buildings under way during the past year, including some of those noted above, were listed by F. P. McKibben, consulting engineer, Philadelphia, in a paper presented at the International Congress of Steel Construction, held in Liège, Belgium, the week of Sept. 1, 1930. Included are the City Hall, Schenectady, which was completely field and shop welded, an 11-story engineering laboratory at East Pittsburgh, Pa., a four-story factory building at Bridgeport, Conn., and a 140 x 260-ft., 45-ft. high, factory building at Oklahoma City, Okla., the last three having been completely welded.

Structural Shops Equipped for Welding

Of interest also are Dr. McKibben's remarks on the present attitude toward welded steel structures. Only four years ago the safety and practicability of applying welding to steel buildings and bridges were questioned by most structural engineers and steel fabricators, he said. Today, much of this scepticism is dissipated, and while the process is by no means universally acceptable, the old inertia has been quite largely overcome and welding is progressing to the extent that nearly all structural shops are using the process to a greater or less extent. It must not be inferred from this that welding has replaced other forms of connecting steel members, for such is not the case, he said; riveting remains the principal form of construction, but the usefulness of welding is fast being acknowledged.

Steel building frames may be welded either with oxy-acetylene or the electric arc, said Dr. McKibben. The largest structure thus far welded with oxy-acetylene is a research laboratory, 75 by 260 ft. by 42½ ft. in height, at Niagara Falls, N. Y., although gas is widely used in welding other steel forms, it has not been applied to any appreciable number of steel building frames, nor have atomic hydrogen, the shielded arc or thermit welding been used for this purpose but are successfully used in many other places. Nearly all welding on steel building frames has been performed with the metallic arc.

Automatic Welding Machines for Structural and Pipe Welding

Electric resistance processes are being applied on a large scale to the spot and butt welding of bar joist and other similar building

OF the several multi-story structures totally or partly welded during the past year, the tallest was a 19-story office building in Dallas, Texas.

As late as four years ago the safety and practicability of welding steel buildings were questioned by most structural engineers and steel fabricators. Today much of this scepticism is dissipated and nearly all structural shops are using the process to a greater or less extent.

Welding has not replaced other forms of connecting steel members; riveting is still the principal method of erection but the usefulness of welding is being increasingly recognized.

Some of the improved welding equipment made available during the past year or so is briefly described in extracts from an article by L. D. Meeker, of the General Electric Co.



Overhead weld being made on a continuity plate of 13-story office building of the Southern California Edison Co., Los Angeles. All earthquake bracing was fabricated by metallic arc welding, General electric type WD-300-A equipment being used.

parts. These processes seem to be quite suitable for shop fabrication of light material.

The past year, Dr. McKibben pointed out, has witnessed an interesting extension in the use of automatic gas or electric welding machines for shop fabrication of structural steel and for pipe manufacture. Ordinary welded connections of beams to beams or beams to columns do not lend themselves to machine welding, but in shop fabrication of plate girders or composite columns having long lines of welds automatic welding is being increasingly applied with success and economy.

Aside from the economic value of noise elimination in many locations, the savings from welding lie principally in the use of less steel in trusses or plate girders said Dr. McKibben. An interesting development, he points out, is the application of welding to existing steel bridges and buildings which are overstressed.

Welded Battledeck Flooring for Charging Floors

The new automatic arc welding machine for use on battledeck floors developed during 1929 and sponsored by the American Institute of Steel Construction is among the new equipment mentioned in Mr. Meeker's review. One large steel company is using this battledeck construction for the charging floors of two new open-hearth furnaces; one of these was welded by hand and the other by means of the battledeck welder. This new automatic machine was also used to weld the floor of an addition to a garage at Pittsfield, Mass. This floor, measuring 40 x 160 ft., will be used for car storage and will not be covered or treated in any way.

Semi-Automatic Equipment for Open or Hydrogen Shielded Arc

An improved portable semi-automatic arc welder for use with either the open or hydrogen shielded arc, the welding tool being arranged so that it may be readily changed from one to the other, is another item of new equipment mentioned in Mr. Meeker's review.

The equipment consists of a simple motor-driven wire feeding device, a flexible lead and welding tool. This, together with the necessary control equipment, resistors, and reactance, is mounted on a wheeled framework. A fractional horsepower variable-speed motor drives the electrode wire through a gear train and knurled feed-rolls, permitting an infinite number of wire speeds between 6 and 36 in. per min. This device feeds the electrode wire from a reel continuously to the hand of the welder, making it unnecessary to stop to replace the short ends with new electrodes as with the ordinary short lengths used in hand welding. In addition, it eliminates the short-end waste. Its applications are those which lie between hand welding and full automatic welding; it may be used with particular advantage where the quantity of welding is large, but the type or location of the welding makes it impossible or inadvisable to weld automatically.

Automatic Atomic Hydrogen Arc Welding

One of the problems in connection with atomic hydrogen arc welding has been the development of a device which would produce the ductile and dense welds automatically and at greater speeds with higher currents than were feasible with hand operation. For years the secret eluded the designers, but now such an automatic machine is available, says Mr. Meeker.

The welding head consists of two motor-driven, relay-controlled electrodes for striking and maintaining the arc. Jets of hydrogen are directed through the arc. Movement of the arc in any direction is obtained by micrometer screws, and although control of the arc is fully automatic, provision is also made for the manual adjustment of the electrodes.

For welds to which a filler rod must be added, a wire feeding device is mounted beside the head with a nozzle directing the filler rod into the welding flame. By means of the variable speed motor and gear changing device, the speed of feed of the filler rod can be varied over a wide range.

The welding head and wire feeding device may be mounted in several ways, either stationary as when circular seams are to be welded, or on the usual type of travel carriage to weld a seam in plates held in a clamping mechanism below the arc.

Ammonia Dissociator Now Available

One of the objections to the use of the atomic hydrogen arc has been the cost of hydrogen. This has been met by the development of two processes for supplying a suitable gas for the atomic equipment. The dissociation of anhydrous ammonia into hydrogen and nitrogen is accomplished in an "ammonia dissociator" that consists of a means of electrically heating the ammonia gas to the proper temperature, which is automatically controlled, and then passing it over a catalytic agent which dissociates it into its component gases. The resultant gas, it is stated, is about one-half as expensive as tanked hydrogen.

The other process is the production of Electrolene, which is cracked city gas. The equipment for producing Electrolene is more expensive than the ammonia dissociator, and is not available in the small capacities required for the installation of only one or two hand torches. On the other hand, for the installation of two or three automatic atomic equipments or six or more hand torches, the Electrolene producer justifies its higher installation cost, for the gas produced is only about one-fourth as costly as hydrogen in tanks.





WHAT THE FOUNDRYMAN FACES IN 1931

By HENRY M. LANE
Foundry Engineer, Detroit

WHEN the foundryman pauses at the beginning of 1931 to cast up accounts and plan for the future, there are certain factors that are likely to stand out very prominently in his mind.

The past year has seen very keen competition among individual plants for the same class of castings and among allied industries, such as forging, stamping and welding, in their attempts to replace castings.

Competition among the foundrymen themselves makes it necessary for the survivors to pay strict attention to every possible internal saving that can be made so as to give low costs. Improvements in the mechanical end take the form of better pattern equipment, better molding methods and more efficient use of handling appliances.

Careful thought should be given, however, to the installation of mechanical-handling equipment and other devices to be sure that all factors are taken into account. Some foundries have installed conveyors and other appliances which have not always proved to be an asset when depreciation, upkeep, varying volume of output and all of the factors involved are taken into consideration. Every foundryman should be sure of his step in making improvements of this kind.

Foundries Reaching Out for Quality Work

THE brightest phase of the foundry field, as this writer sees it, lies at present in the greater activity among foundrymen with respect to research work and improved output. The Gray Iron Institute is getting into full swing and is covering a field which brings the gray iron branch of the industry into line with the malleable and steel divisions, which for a long time have had extensive research programs.

As a result of this work, foundries are beginning to reach out for quality work more than ever. Quality work may involve great accuracy which saves machine shop work, or it may involve superior metallurgical qualities that make the product better suited for its use or enable it to replace forgings, stampings or welded structures, which have been making inroads into the castings industry.

A careful study of the metallurgy of castings has resulted, first, in better chemical and physical control of the product and, second, in new alloys. The malleable industry has long had its certified malleable and the steel castings industry, in like manner, has had its high-test castings, many of which are heat treated. Now the gray iron section is beginning to turn out special irons having a tensile strength of from 40,000 to 50,000 lb. per sq. in. These castings are the result of superior cupola practice, the use of new melting methods such as the various types of electric furnace, or the results may be accomplished by a duplex process including both cupola and electric furnace.

The offering of these new high-grade cast irons has caused designers and manufacturers to adapt their manufacturing processes to the use of such material.

FOUNDRYMEN face new situation wherein internal cost savings, research work and quality product will be of even greater importance than in the past. More than ever, also, foundries must become highly specialized units, each designed for its own particular product. Education of the public to the value of quality castings should be continued, says the author.

Foundries of Future Must Be Highly Specialized Units

THERE will always be a place in the foundry field for the general jobbing shop, turning out castings of which only small numbers are required, but by far the larger number of foundries must, in the future, be highly specialized units, each designed for its particular product. This means that, more than ever before, we should not consider the foundry as a building containing certain pieces of equipment, but the whole unit should be a machine for the production of castings.

For several years there has been a steady decrease in the total number of foundries in operation, and yet the total tonnage melted is

(*Concluded on page* 49)

ELECTROPLATING—RECENT

By DR. COLIN G. FINK
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DURING the last few years the number of electroplating installations has increased by over 1000 per cent. The art is being rapidly standardized, and everywhere we now hear of scientific control, unheard of but a few years ago. Electroplating is no longer a trade, but a profession requiring not merely skill but a thorough knowledge and training in chemistry, physics, and, notably, metallurgy and metallography.

Chromium Plating

THE outstanding electroplated metal today is chromium. Applications of chromium plating, which only a few years ago were considered impossible, are today a commercial success. Thus, for example, the chromium plating of aluminum and aluminum alloys is done on a large scale. Similarly, chromium plating of die casting alloys. Interesting applications are the chromium plating of stellite mirrors and the chromium plating of the Krupp chrome-nickel alloy commonly known as "18 and 8."

Chromium plating has been resorted to on three counts:

As a protective coating guarding the underlying metal against corrosion not only of the atmosphere, but of highly corrosive gases such as those, for example, containing sulphur to which chromium is immune.

From the popular point of view, chromium plating is used largely for decorative purposes. On account of the metal's resistance to both tarnish, corrosion and wear, the surface of the plate for decorative purposes has supplanted or displaced not only the base metals such as nickel, but even the noble metals such as silver.

Chromium plating is being used for special purposes such as rubber molds to resist the action of sulphur, high temperature equipment to protect the underlying metal from burning or oxidation, and special bearings utilizing the extreme hardness of the electrodeposit.

Zinc and Cadmium

WITH cadmium as a serious competitor of zinc as a protective coating for iron, steel, and other metals, improvements have been made in zinc galvanizing. Reports on the relative merits of zinc vs. cadmium coatings for iron and steel parts have not been entirely consistent, and at the present writing it is not definitely established which of the two metals will give the more serviceable protective coating.

Investigations have been made, and results look very promising indeed, on the co-deposition of zinc and cadmium. It is felt that an alloy of the two metals will probably be superior in protective quality to that of either metal alone.

The general trend to substitute for the cyanide baths, notoriously unstable besides being poisonous, baths of the more stable salts such as the sulphates, has likewise affected the zinc and cadmium plating industry. With the advance of the electrometallurgy of zinc and cadmium, and the determination of the best conditions under which these two metals can be deposited from sulphate solutions, as practiced by all of the large zinc companies, including the Anaconda, Consolidated Mining & Smelting, and Australasian, it was not difficult for the electroplaters to substitute the sulphate baths for the cyanide baths. A number of plating establishments are now using the sulphate bath in place of the cyanide.

Electrodeposition of Alloys

THE history of the last few years of the plating art will record two oustanding events:

The world-wide introduction of chromium plating and the general commercialization of the electrodeposition of alloys in place of single metals.

Until recently brass and, in a few instances, bronze were the only two alloys commercially electrodeposited. Researches carried out at the laboratories of the Western Electric Co., the Westinghouse company, and at the laboratories of a number of the universities, have resulted in the working-out of a commercial process for the electrodeposition of iron-nickel alloys, copper-nickel alloys, gold-nickel (white gold), lead-silver, lead-thallium, and others.

Furthermore, practical methods have been worked out for the co-deposition of a metal and a colloid. Thus, for example, graphite and copper, graphite and tin can be co-deposited. Of special interest is the deposit of magnetic iron-nickel alloy, thus bringing about a ready means of producing thin films of these alloys, cheaper than by casting the alloy and rolling into thin sheet. It will be recalled

DEVELOPMENTS AND FUTURE PROSPECTS

DR. FINK, to whom basic patents on chromium plating were granted a few years ago, discusses three reasons why chromium plating is extensively used.

He suggests that an alloy of zinc and cadmium for plating will probably be superior to either metal alone.

Several alloys can now be successfully electroplated and a metal and a colloid can now be co-deposited.

Future developments come in for comment.

that the Western Electric Co. developed the so-called permalloy and Mu metal, characterized by their high permeability and low hysteresis.

A New Electrolytic Cleaning Process

DURING the past year a new electrolytic cleaning process was patented by the Bullard Co. of Bridgeport. (Thomas E. Dunn, U. S. Patent No. 1,775,671, Sept. 16, 1930.) The essence of this process is the ready removal of scale and other extraneous surface matter from iron, steel, and other metals by making the article cathode in an aqueous bath containing metal salts. During the cleaning operation a thin film of metal is deposited on the surface of the iron, steel, or other metal object, and two very important steps are accomplished.

First of all, the surface of the metal is cleaned without any pitting whatsoever—pitting, so familiar to all who have used the acid pickling baths. Secondly, the hydrogen embrittlement of the iron or steel is avoided. Hundreds of small watch hair springs have been treated by the Bullard-Dunn process without in any way affecting the elasticity of the springs during the cleaning operation. With slight modifications of the bath, the process is applicable to all commercial metals.

Future Developments

RESEARCH activities in the electroplating art at the various industrial and university laboratories are greater at the present time than ever before. Further important developments are expected in the deposition of alloys, alloys which are to be used not merely for protective and decorative purposes, but alloys for special uses such as, for example, for contacts, for photochemical reactions, as catalysts, for special electrical appliances, etc.

Work is also being carried forward in the electrodeposition of the rarer metals for, although the cost of these per pound is extremely high, nevertheless, many of these rare metals possess very distinct properties and the quantity necessary can be reduced to a minimum by the electrodeposition of a thin film. An interesting phase in the development, as mentioned above, is the chromium plating of the "18 and 8" chromium-nickel steels. At first thought this may seem like "painting the lily," but, with our fuller appreciation of the underlying principles and causes of corrosion, the selection of a highly corrosion-resistant alloy, and then further protecting its surface with a film of uniform composition and potential, seems to offer an answer to some of the stringent specifications met with today.

What the Foundryman Faces in 1931

(*Concluded from page* 47)

constantly increasing. This tendency undoubtedly will continue for several years as the business is gradually drawn into the stronger and more capable hands.

One thing the foundrymen themselves must do is to continue the education of the public to the value of quality castings.

A rather careful study of the foundry field throughout the country indicates that there will be an increase in tonnage during the next few months, starting slowly but gradually gaining in volume and probably continuing to do so for a period of years.

The foundry field today is far more attractive for energetic young men than almost any line of manufacture, but those who enter it must know that there is hard work ahead, as has always been the case in this division of manufacture.



Photograph by Rittase, Philadelphia

▲ ▲ ▲

The power, and withal precision of control, of the gigantic forging hammer is ever a source of admiration.

▼ ▼ ▼

MOTORIZED DROP HAMMER MORE WIDELY ACCEPTED

By MACDONALD S. REED
Sales engineer, Erie Foundry Co., Erie, Pa.

GENERAL acceptance of advantages of individual motor drive for drop hammers featured developments in 1930, but many forging shops took advantage of the lull in activity to check up on wasteful operating practices and obsolete equipment. Business of hammer makers has been bolstered by export trade, Soviet Russia in particular taking the latest in high-speed production equipment.

THE outstanding development in the drop-forging industry during 1930 has been the general acceptance of the self-contained motor-driven board drop hammer.

Hammers of this type had been built previously but their use was rather limited. Now, however, they are built by at least three of the leading manufacturers.

The same general points that are argued for and against individual motor drives on machine tools apply likewise to hammers. There are two advantages, however, that are peculiar to hammers. Belt-driven hammers are usually driven from a lineshaft running along the wall rather than overhead; to assure a satisfactory drive, the hammers must be set out from the wall, usually farther than other clearances would require, so that there is some waste of floor space. Furthermore, the belts run approximately horizontal from the hammer pulleys and due to the high belt tension that is necessary, they exert a considerable over-turning moment on the hammer. Braces are usually provided to resist the pull on the belt, but it is difficult to locate them exactly in line with the belt pull; the result is that the load is not uniformly distributed on the joints at the top and bottom of the frames so that these parts wear out of square and the hammer alinement is soon destroyed. Both of these difficulties are overcome by the individual-motor-driven hammer.

The hammers now on the market show three radically different types of construction, various arrangement of chains or gearing being used to transmit the power from the motor to the rolls. Within another year, no doubt, one of these types will have established its superiority. The tendency of the forge shops recently in choosing their equipment has been to favor machines with the fewest troublesome elements, using materials that will give the best wear, with the best provision for lubrication, with the lowest friction losses, and providing the maximum of safety for the operators.

Economy of Different Types of Hammers Studied

In all organizations there is a tendency to tighten up in lean times; in line with this the past year has seen considerable study given to the relative economy of board drop hammers, steam drop hammers operated by steam, and steam drop hammers operated on compressed air. Operators of steam drop hammers, convinced that the operating flexibility of these machines makes them superior, have been endeavoring to improve the economy of their operation so that they can better compete with board drop hammers. A number of organizations are trying to ferret out and eliminate wasteful practices in shop operation, and are demanding valves of improved type to eliminate leakage of steam at this point, and valve gearing that will use the steam most economically.

Among the commercial drop forging shops, those specializing in automobile work have probably been hit the hardest, although a number of them have seen the advantages of utilizing the slack period to replace obsolete equipment. Some other lines have been fairly active, while the business of the hammer manufacturers has been bolstered up considerably by the export trade.

A number of industries in some European countries are arriving at the point of production where drop forgings economically replace other materials. No European hammer has ever been developed to stand up to high-speed production as we know it here, and the European manufacturers adopting American methods must also turn to American machines. This applies as well to Soviet Russia, where plants are being erected for large scale production of automobiles, trucks, tractors and agricultural machinery.

One manufacturer, in speaking of his latest type steam drop hammer, which has been on the market for about two years and shows outstanding advantages over previous types, states that more of them are installed in Russia than in the United States. If the Russian experiment is successful and if the technical personnel can be trained to operate the equipment, then after the Russian domestic market has been satisfied, American manufacturers will be forced to replace obsolete equipment in order to be successful in world-wide competition.

NITRIDING—ITS PRESENT AND FUTURE STATUS

By DR. V. O. HOMERBERG
Technical Director, Nitralloy Corpn.

DEVELOPMENTS in nitriding, as outlined by Dr. Homerberg, include the following:

Nitromal, a malleable cast iron, which can be case hardened with ammonia gas, has reached the semi-commercial stage.

Nitriding has been applied for the surface hardening of special alloy tool steels.

A gray cast iron is being developed which can be nitrided to a satisfactory case.

Studies are in progress on nitriding in the presence of a carburizing agent, and the effect of pressure on the process.

CONSIDERABLE progress was made during the past year in the development of the nitriding process.

The activity of a number of reputable furnace manufacturers in constructing special furnaces for nitriding, especially to nitride on a large quantity basis, is of great importance. The use of semi-continuous and continuous furnaces for this purpose will greatly reduce the cost of nitriding and thereby promote the increased use of nitriding steels. Many prospective users have calculated the cost of nitriding from experiments conducted in small furnaces and as a result have been led to believe that the process is an expensive one.

A study of the problem of containers that will not affect the nitriding operation has been given careful attention. The substitution of enameled containers for expensive alloy pots is meeting with success.

A new phase of nitriding is its application to the surface hardening of special alloy tool steels. Although this phase of the problem is in its infancy, the experimental results which have been obtained up to the present time indicate that it will receive a great deal of attention in the future. The core hardness of such steels is sufficient to prevent sinking of the case when subjected to high compressive stresses as in drawing dies and similar applications.

A Malleable Cast Iron for Nitriding

THE evolution of Nitromal, a malleable cast iron which can be case-hardened with ammonia gas, has reached the stage where it can be made on a semi-commercial basis. Compositions of white cast iron to give varying degrees of malleabilization have been evolved to meet various requirements. It is a certainty that this new development will be on a commercial basis during the coming year.

Greater attention to nitriding technique is of large importance. It is quite generally understood that nitriding steels should be heat treated and freed from decarburization before nitriding in order to obtain satisfactory results. It has also been fully demonstrated by many large users that articles can be nitrided practically free from distortion, provided proper precautions are observed.

Again, there is a tendency to nitride for too long a time. Judgment should be exercised in studying the requirements of each particular application of a nitrided article. It is undesirable to nitride an article for a long period of time when the only requirement is resistance to wear in which its usefulness will be destroyed after a slight wear has taken place.

Cost Problem to Be Studied

In spite of the many desirable properties of nitrided steels, it has been stated quite frequently that the cost of a nitrided article must be reduced before nitriding will be applied in industries on an extensive basis. It is one of the purposes of The Nitralloy Corporation to make a thorough study of the entire problem and to eliminate this point of objection.

Investigations Now Under Way

MANY investigators, besides the writer and his associates, are giving the nitriding problem a great deal of attention. The following phases of the problem are being investigated in the author's laboratory at the present time:

1. The development of a gray cast iron that can be nitrided to give a satisfactory case. This subject has received considerable attention abroad and some degree of success has been achieved.
2. Nitriding in the presence of a carburizing agent.
3. A study of protective agents against nitriding in an endeavor to determine the means of procuring thorough protection with ease of application and removal of the protective material. Although a number of materials are used for this purpose, at the present time none of them gives entirely satisfactory results.
4. The effect of pressure on the nitriding operation.
5. A study of the role played by hydrogen during the nitriding operation. A number of investigators believe that hydrogen plays a part in the surface hardening while others maintain that the presence of nascent hydrogen is exceedingly harmful.
6. X-ray studies to determine the mode of nitrogen absorption and the mechanism of nitride hardening.

In view of the many investigations that are in progress concerning the nitriding process it is to be expected that a considerable number of valuable contributions on the subject will appear during 1931.

GRINDING MACHINES BECOMING MORE AUTOMATIC

By HOWARD W. DUNBAR
Works manager, Grinding Machine Division
Norton Co., Worcester, Mass.

THE year 1930 has been so subnormal that opportunity to gage the effectiveness of the development in grinding machinery has been almost entirely removed. The new lines and types of grinders displayed at the 1929 Machine Tool Builders' Exposition have gradually had an opportunity to make their usefulness felt. What little opportunity there has been to gage the trend leads to the conclusion that automatic precision and semi-automatic precision machinery, designed to relieve labor of the manual effort involved in the operation of a machine, is decidedly the tendency. That part of mechanical operation involving the skill of the workman is fast being transferred to the machine. What 10 years ago was considered to be an impossibility is now a reality.

Automatic grinding machines in which the work is loaded, ground and discharged from the machine automatically are being used extensively in mass production plants. Even the intricate operation of grinding camshafts automatically is an accomplishment which is satisfying many of the most exacting automobile plants in this country. Hydraulically-operated machines, air-actuated handling devices, and electrically-operated mechanisms are features outstanding in 1930 design.

Changes in Design and Operation in Prospect

What the future holds for the grinding machine manufacturer and what inventions will be developed is of such a speculative character that the predictor must have a great deal of courage to place himself on record in the matter. It seems to me, however, that the future holds for us in the grinding field revolutionary changes in types of machines and the manner of operation. Just as has been the history of the past, grinding, a major and primary operation, will follow the course of development reflected in the improvement of and changes in materials used, providing for the treatment of such materials with machinery arranged and designed to give the maximum of production with the highest degree of quality required.

It would seem that we are on the threshold of a period when all mechanical devices, whether produced for utility or luxury, will depend upon refinement and improvement in the materials used in their construction. I picture radical changes in the form and type of our automobiles, airplanes, building materials, railroad equipment, etc., wherein the principal effort will be directed toward the use of materials of greater strength and lesser weight. It can hardly be conceived that such materials could be machined without the use of the grinding machine and the grinding wheel; consequently the widening of the field for these products.

Already we have had evidence of the demand for multi-cylinder cars, ranging up to 16 cylinders in number. The desire for smoothness of operation and speed will naturally develop a need for lowering of weight and increase in strength of the material used, with general design tending to streamlines, with a minimum of air resistance.

The tendency in design and use of every mechanical device, whether it be in the home or the factory, is toward the elimination of physical effort. We have as examples in the home, the washing machine, the dish-washer, the ironer, oil burners and automatic refrigeration. Further intensifying of this characteristic of the present age will tend in the direction of lessening the hours of labor, leaving more time for enjoyment of these luxuries, which, in turn, will create the demand for better and improved grinding machinery.

AUTOMATIC and semi-automatic operation, relieving the operator of manual effort and transferring the skill of the workman to the machine, is a decided trend in precision grinding machinery.

Changes in types of machines and manner of operation are in prospect, grinding, as in the past, following the course of developments reflected in improvements and changes in materials used.

Radical changes in form and type of automobiles, airplanes, railroad equipment and other mechanical products will involve use of materials of greater strength and lesser weight. Such developments, undoubtedly, will widen the field for grinding equipment.

NON-DESTRUCTIVE TESTING OF

By DR. ANCEL ST. JOHN
President, St. John X-Ray Service Corpn., New York

TWO events during the past year have directed attention to non-destructive tests. In September the American Institute of Mining and Metallurgical Engineers announced the organization of a standing committee on non-destructive tests. In December, the boiler code committee of the American Society of Mechanical Engineers proposed to require X-ray inspection of fusion welded seams in unfired pressure vessels and to extend the sanction for this type of construction, if inspected by X-rays, to include vessels operating at temperatures over 600 deg. Fahr.

Limits of Old-Line Testing Methods

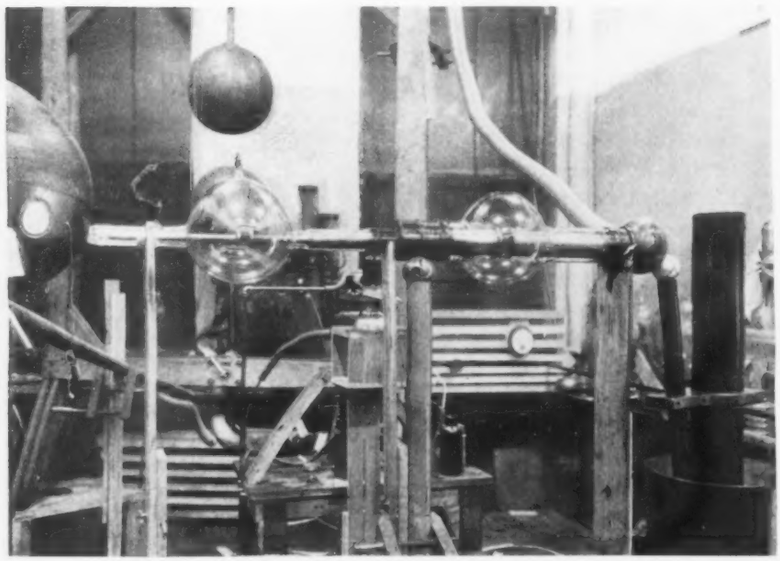
In these days, structures of all kinds are subjected to loads or to services which were scarcely imagined 20 yr. ago. But, for the most part, the old-line tests are trusted to determine whether material is suitable for service. These tests furnish only partial information. At the most they tell what the particular piece tested did at the particular time, and they really say nothing as to what that piece will do at another time or what other pieces from the lot will do.

In fact the writer has a vivid recollection of a casting for high pressure steam service, selected by the buyer's inspector as the "best of the lot" which was shown by the X-ray examination to be badly cracked as a result of the hydrostatic test. The maker and the buyer both believed that casting to be sound and serviceable. The X-ray inspection proved it totally unfit.

Where little financial loss and no danger to life or limb are involved in a failure of material in service, the old-line methods may be satisfactory. The user can proceed merrily in his belief that his material is all right because certain test specimens were passed. But where failure may cause serious financial loss or personal danger, the user is entitled to know all he can about the fitness of the material. If tests are available that are competent to disclose concealed conditions which are intolerable, and to distinguish between these and other conditions which are objectionable but nevertheless permissible, he is entitled to require such tests. But until tests of this sort become trade customs, he is also entitled to pay for them.

Dollars and Cents Chief Factor

Non-destructive testing is therefore a matter of dollars and cents in all cases. The man who pays for the tests has a right to demand the lowest cost consistent with adequate information. He will use the test or combination of tests that does this. He may ask that



A 500,000-volt X-ray tube in the research laboratory of the General Electric Co., at Schenectady, N. Y.

METALS—PRESENT AND FUTURE

NON-DESTRUCTIVE testing is a matter of dollars and cents.

Ability to distinguish between permissible and non-permissible defects is the rock upon which many non-destructive test methods have failed.

Developments in non-destructive tests are along two distinct lines—distinguishing between normal and abnormal material.

it tell him not only the present condition of the material but also its probable condition after considerable time in service. He will certainly insist that it distinguish between permissible and non-permissible defects.

This ability to distinguish between permissible and non-permissible defects is the rock upon which many non-destructive test methods have failed. There is at present no single test which will do this in all cases. In many ways the most highly discriminating test as to the distribution of material is radiographic examination with X-rays. Sound material, cavities, inclusion and cracks can usually be distinguished. But it says nothing as to the tensile strength, ductility and impact resistance of a casting or other object. Fluoroscopic examination with X-rays discloses the same sort of information as radiographic examination, but is less sensitive. Magnetic, electric and sonic tests seldom determine the exact character of the abnormal conditions they are able to indicate.

Two Lines of Future Development

Looking into the future, we see non-destructive tests developing along two distinct lines. One will be concerned with distinguishing normal material from abnormal. The other will be directed to distinguishing abnormal material which is permissible from that which must be rejected.

The first will be rapid and economical enough to be applied to overtime production. The second will be more discriminating, probably slower and probably more expensive. But it will be applied only to the material which stands rejected by the first test, or to material for such critical service that the most discriminating test is advisable in the first instance.

In the first case the greater time and expense will be justified by the recovery of usable material. In the second it will be justified as insurance. Availing himself of these opportunities, the enlightened manufacturer will be able to say truly that he knows his product is right. When necessary he will be able to prove it. The others will go along in the same old way.

Bethlehem Installs Annealing Furnaces for Carbon and Alloy Steel Bars

APPLICATION of electric heat in steel plants for such processes as annealing sheets, wire, coil, strip, tin plate, and alloy steel bars made important progress during the past year.

One of the outstanding furnace installations consisted of five furnaces for heat treating and annealing bar stock of carbon or alloy steel 25 ft. long at the Bethlehem, Pa., plant of the Bethlehem Steel Co.

Two of these furnaces are of the pit type, each capable of taking a charge of 50 tons of steel. The inside dimensions of each furnace are 27 ft. long by 8 ft. 6 in. wide by 6 ft. 6 in. high. Heating elements are of the ribbon resistor type with a connected load of 1100 kw., at 220 volts, three-phase, and each furnace is divided into six control sections—three along the top and three along the bottom.

The material to be heat treated is loaded into U-shaped racks or cradles made from castings of heat resisting alloy. Each furnace holds two of these cradles. Special lifting beams are provided so that a crane may lift the cradles and set them evenly down in the furnace.

Each furnace has a removable cover extending the full length, which is handled by a special crane which travels over the two furnaces. As a means of accelerating the cooling portion of the cycle, pipes of heat resisting alloy extend across the under side of the cover and are connected to a duct system. A blower is arranged to blow air through the pipes, thus extracting heat from the furnace chamber without admitting air to the chamber itself. This arrangement gives comparatively rapid cooling without excessive oxidation of the charge.

The installation also comprises a double chamber car bottom type of furnace. The ribbon resistor heating units in each chamber have a connected load of 700 kw.

The remaining unit of this large electric furnace installation is a roller hearth type of furnace used for normalizing or quenching bar stock 25 ft. in length. This furnace has a capacity of 6000 lbs. of steel heated per hr. to 1650 deg. F. The total connected load of the ribbon resistor heating units is 975 kw.

The roller hearth furnace, together with its pre-heating and quenching equipment, is entirely automatic in operation.



A HALT IN THE UPWARD GROWTH OF BUSINESS



By DR. LEWIS H. HANEY
Director, New York University
Bureau of Business Research

THE year 1930 was one of major recession and liquidation, resulting from the previous over-expansion of credit and over-production both of commodities and securities. During most of the year there was a steady decline in production and in prices, which declines were probably intensified and prolonged by premature attempts to stimulate business at the beginning of the year. An extraordinary number of bank failures marked the existence of much frozen credit.

The Present—Important Maladjustments 1931's Problems

AT the end of 1930 we find business far below normal. Industrial production, if measured from the long-time trend of the past decade, is about 30 per cent below "normal," which compares with about 25 per cent below in 1921. (Iron and steel production levels, while now about 45 per cent below normal, compare with 65 to 70 per cent below normal in 1921). Railway freight tonnage is something like 26 per cent below "normal" (in the foregoing sense), against 20 per cent in 1921. Bank debits have fallen with extraordinary sharpness, and at a guess are something like 25 per cent below their previous trend. Wholesale trade and retail trade appear to be approximately 15 or 16 per cent below trend.

It is perhaps worthy of note that the volume of wholesale and retail sales appears to have declined less than the indexes of production, both absolutely and in comparison with the distances below normal reached in 1921. Moreover, the decline in sales is partly due to the decline in prices of the goods sold.

The foregoing facts, together with the depth of the recession, warrant hopes that a stabilization period is not distant. Even now, however, commodity prices continue to decline, the purchasing power of consumers is greatly impaired by unemployment and depressed farm conditions, and the immediate outlook for the bond market is not such as to encourage hopes that new issues can be marketed in considerable quantity.

In fact, at the end of 1930, we find a number of important maladjustments still existing and considerable evidence that further readjustments will be required. In the field of commodity prices we find retail prices out of line with wholesale prices, raw materials out of line with finished goods, and various individual commodities out of line with one another.

Bank loans and investments appear to be somewhat excessive in comparison with total bank deposits, or with the indicated requirements for bank credit on the part of business, as illustrated by an accompanying chart. Considerable security indigestion is manifest. Some maldistribution of the world's gold supply seems to exist, and the difficulties connected with international payments are great. These are some of the problems for 1931.

The Future—Next Few Years Offer Doubtful Promise

ACCORDINGLY, the outlook for 1931 business must be considered as being highly uncertain. The year is likely to go down in business history as one of depression, in which many of the readjustments required by the excesses of 1929 were made. Business as a whole does not seem likely to get ready for recovery before mid-year—possibly not until fall. Purchasing power and retail trade are likely to be dull until fall. It is highly improbable that business will return to "normal" at any time in 1931. Any premature spurt due to artificial stimulants would probably bring a reaction and prolong the depression.

The normal expectation is that iron and steel production, allowing for seasonal conditions, will continue downward during the first two or three months of the year, and that steel prices will remain unsettled until fall.

But if all the efforts of individual business men and the Government are bent toward a wise completion of the necessary readjustments, these may be effected by about mid-year, and we may hope for the beginning of sustained recovery in the fall months.

The broad background for this somewhat agnostic attitude is to be found in the uncertainty as to the *long-time trend* of business dur-

WE are facing a fairly protracted check in the ever onward ever upward growth in business, Dr. Haney suggests. In that eventuality there will be a call for a modified charting of sailing in iron and steel and the engineering industries.

The free play of economic movements, meanwhile, have been hobbled, in his opinion, by what he describes as the faulty functioning of half competition and half monopoly. He expresses doubts as to the wisdom of any rewriting of the anti-trust laws that is aimed to eliminate the "old organization for competition" for the "new forces of stabilization."

The increasing self-sufficiency of foreign markets in respect to products of a character obtained largely only from America is regarded as pointing to greater competition from abroad.

The question of the supply of gold and its present maldistribution is despatched as a factor of secondary importance.

ing the next few years. It can hardly be denied that there is a reasonable possibility that the long-time trend of business will not be upward for several years to come. The statistical evidence can not be presented here, but it is quite apparent that uncertainty in this regard lies at the bottom of the prevailing attitude of business men and financial leaders. Evidently allowance is being made for the possibility that a readjustment in the general basis of valuation may be necessary. We have only to reflect that for the past four or five years business and financial plans have been increasingly built upon the assumption of a steadily rising trend in business activity and earnings, to realize how important the foregoing possibility is. Let us consider some of the factors which have a bearing upon the so-called long-time trend.

Commodity Prices in Drastic Readjustment

IN the first place, we may mention the outlook for commodity prices. After the sharp drop of 1920, prices recovered and remained at a rather stable level to 1928. Beginning in that year, however, there came a steady decline which has brought commodity prices down nearly to "prewar levels." At first the decline in prices was met by the increased mechanization of industry and mass production methods. This procedure was aided by a stimulation of buying through the increased use of consumer credit and "installment" payments. Finally, however, in 1929, these methods reached a limit, and we now find ourselves in the process of a more drastic readjustment to new and lower price levels—probably including the price of labor or "money wages." The completion of these readjustments may well prevent any early resumption of the upward trend of the earlier post-war period.

Certainly the decline in commodity prices has greatly affected the whole problem of the payment of international debts. As usual, debtors of all sorts are suffering severely as the result of declining price levels.

Industrial Control Affects Freedom of Economic Swings

IN connection with prices, we note that our industrial order was founded on the ideal of competition and individuel initiative. Our anti-trust laws, and the judicial decisions thereunder, on the whole embody this ideal. But in the post-war period many business men have come to have much the same attitude toward the laws designed to enforce our competitive order that some of us have toward "prohibition." As a result, a conflict has arisen between the old business ideals and laws and the present-day desires and practices.

Increased integration and the multiplication of holding companies and trade associations have in some cases developed in such a way as greatly to limit competition. Our foreign trade relations (for example, in copper and oil) now as always are a disturbing factor in the enforcement of domestic competition. Of late, our government itself has appeared at times to look with sympathy on various trade restraints, apparently under the influence of a desire to stimulate business. There has been an extraordinary amount of price maintenance and arbitrary "stabilization" with combinations and restriction which limit the freedom of bargaining found on all sides, and one result is that *the freedom and elasticity with which prices are adjusted to the conditions of supply and demand have been greatly impeded.* "Marginal," or high-cost, producers are kept alive by the maintenance of higher than necessary prices through agreement and concerted pro-rata restriction of production.

Without attempting a full discussion, it may be said that business methods are not in line with the existing legal institutions of the country or with the system of control under which our business organization has been built up. A system of regulated monopoly is doubtless feasible. So is one of government operation of industry. Conceivably we may be headed toward either or a combination of the two. We have not been prepared for such systems, however, and the present mixed situation of half competition and half monopoly has functioned so poorly as to lead many observers to criticize business leadership.

All this is now in question, and the anti-trust law is again a live issue. Its fundamental importance lies in the question as to whether American business is to continue under the direction of the laws of supply and demand, as these work out under competition, or is to be more and more directed by some mixture of governmental and private group control. We should face the facts and think the problem through. While the ends of any system of controlling the business enterprise of a nation may be the same—and the ultimate justification of each must be—the practical results may be very different. Has any individual, or group, or government ever been able to fix true economic values and adjust supplies to demands in such a way as to allow the maximum of profitable exchanges? Is competition (perhaps "reasonable competition") not still the best way to economic welfare?

The Problem of Gold

CLOSELY connected with the matter of price levels is the gold situation. The importance attached to the gold supply as a factor in determining price levels and

business conditions depends much upon the degree of acceptance given to the so-called "quantity theory" of the value of money. On this score, however, we need only observe that, while the quantity of gold obviously does affect the value of gold and therefore prices measured in gold, it is another matter to conclude that the value of money depends entirely upon the gold supply or that prices depend entirely upon the supply of money.

Today the United States is continually importing gold, and its supply of gold and its volume of bank credit are great; yet commodity prices continue to decline. This is a fact. Certainly there is no evidence that the banks, by contracting the volume of credit, have been able or may be able to control price levels. From 1927 on, the increased supply of credit went largely into the stock market, not into commodities. We may conclude tentatively that the gold supply as a basis for bank credit is an important factor, but that it is only one factor and probably not a controlling one.

As to the facts concerning the gold supply, we find no conclusive evidence of a world shortage of gold, nor can it be definitely stated that there will be a shortage during the next five years. All students of the subject agree that there are considerable possibilities that the use of gold may be greatly economized, and that some stimulation of gold production (notably in South Africa and Canada) may offset an otherwise declining trend in output. Plans are definitely taking shape looking toward a greater concentration of our gold supply in the reserves of central banks and toward increasing and perfecting the use of the gold exchange standard.

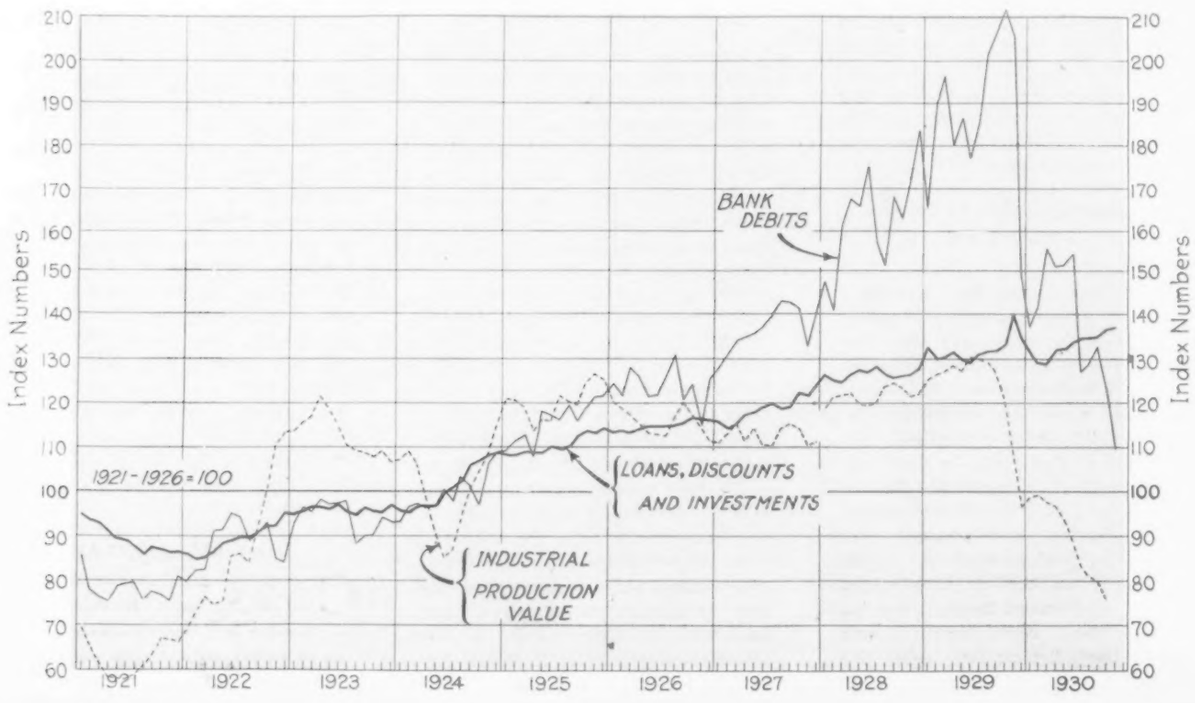
It does seem reasonably clear, however, that a real maldistribution of the world's stocks of monetary gold has developed since the war and has been largely increased through the operation of international debts. Most students of the subject appear to agree that this maldistribution is an important factor in the business situation and one which has powerfully influenced international trade. We may have approximately the same total amount of gold, but when, as is now the case, the United States and France have over half of the total, it is practically impossible that the gold supply can be as effectively used as it would be if there were a more equitable distribution. United States has more gold than it needs; Austria and Germany, for example, have less than they need.

This condition encouraged inflation in the United States ("gold inflation") which was largely directed into real estate and the stock market and contributed to the excesses that have been chiefly responsible for the present depression. Probably it was only the very large volume of production and the excessive requirements of the stock market which prevented a more obvious inflation in commodity prices, though even here we must remember that it now appears that commodity prices in 1928 and 1929 were maintained at an unduly high level in comparison with production costs or normal values.

On the other hand, the situation has brought financial difficulties to other countries, increasing their troubles in stabilizing currencies or making payments on debts—even threatening their solvency. In the struggle to stabilize currencies and get on a gold basis, there has appeared at times to be a veritable "scramble for gold." This has doubtless tended to increase the market value of gold and the purchasing power of gold money, which, in turn, is but another way of saying that it has tended to decrease commodity prices (in terms of gold).

As to the broader long-time outlook, a majority of qualified observ-

COMPARING industrial production in 1930 with that in 1921 gives an indication of the severity of the depression. Bank debits have fallen to about 25 per cent below recent trend.



ers appear to lean toward the conclusion that *probably* the underlying broad trend of commodity prices will be downward during the next decade. If this trend actually develops, it may be due chiefly to increasing production of commodities, or to decreasing costs of production, or (in the more immediate future) to continued deflation of credit.

Some consider that a shortage of gold may result from a decreased output of that metal beginning in a few years from now, and that this will tend to bring lower prices. In my opinion, however, it is not possible to say more than that. It is at least a possibility, and perhaps a slight probability, that gold production will not increase much in the next few years and that it will decrease somewhat over the next decade, and that this possibility (or probability?) may be considered as heightening the probability that the trend of prices will be toward lower levels.

The most clear-cut conclusion from a consideration of the gold situation, and the only one that seems entirely free from question, is that a considerable redistribution of the world's monetary stocks of the metal would materially contribute to the stability and improvement of the general business situation.

Incidentally, this statement reminds us that perhaps more than at any other time in history, the present depression is *synchronously* world-wide. More than at any other time, the United States is a creditor nation and, therefore, dependent upon the welfare of its foreign debtors.

Changing International Industrial Relations

IN addition to the trend of commodity prices, the maldistribution of gold and the conflict between our old organization for competition and the new forces of "stabilization," there is an increasingly difficult international business situation which comes to a head in greater competition from abroad and declining exports.

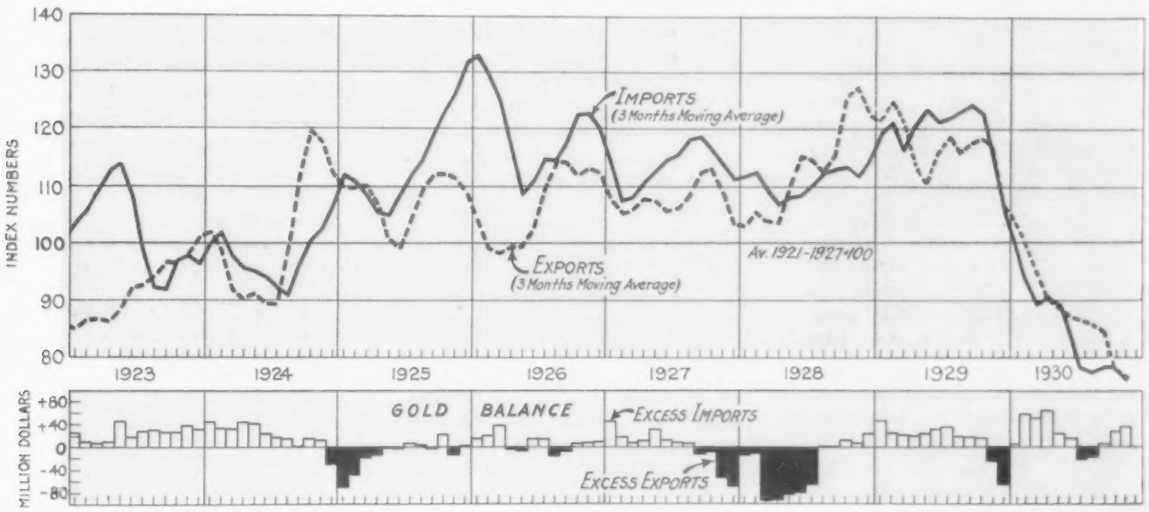
Take the copper industry, for example: The outlook here has been virtually revolutionized by the development of large new sources of cheap copper in South Africa and Canada. One can hardly have the same attitude toward the future of copper prices or of the securities issued by many American copper companies that would have prevailed a few years ago.

If we turn to oil we find a similar situation. The oil market has become more highly international than ever before and the increasing production of Russia and of foreign interests in South America must be increasingly recognized.

We have been forced to go on a domestic basis in wheat. To an increasing extent foreign grown cottons have come to meet the requirements of foreign spinners, so that the same total supply of "American" cotton now means a lower price per pound than formerly, even after discounting the general decline in commodity prices. The Japanese cotton manufacturing industry is relatively new as a world factor.

In many ways, through industrial development in European countries, development of new sources of raw materials (crops and minerals), the imposition of tariffs, and changes in the purchasing power of currencies and silver, the foreign trade map is being changed. The outlook for our foreign trade is uncertain. Who can say that the trend will be upward as it was from 1921 to the beginning of 1929?

In this discussion we have touched all too lightly on several fundamental problems. The issues involved in some of them may be called vital. They involve some questions which go to the bottom of our social and economic order. Delicate international affairs are concerned. No one should be dogmatic about such matters. No one, for example, can prove either that regulated competition or that regulated monopoly is the better for the nation. Above all, what we need is to formulate the issues definitely and to face them squarely. Never has the nation during the life of the present generation been more in need of straight thinking on broad economic matters—including the organization and direction of domestic business, public finance and international commerce—than it is today—and will be during 1931.



Both exports and imports have sunk to low levels.

DECLINING PRICES AND MALDISTRIBUTION OF

By HAROLD L. REED

MUCH is heard nowadays about the influence of gold supply upon commodity prices. In a scholarly analysis Professor Reed points out that commodity markets have been affected more by maldistribution of monetary gold than by the total size of world stocks of the metal.

He takes the view that effective regulation of gold flow does not require the setting up of a "super-international" banking organization. Federal Reserve policy succeeded in turning the gold inflow of

NOW that we have been in the grip of depression for a year and a half, it is coming to be recognized generally that the underlying disturbances have been fundamental and profound. Neither the palliatives of cheap credit nor of organized cooperation among business executives have been able to initiate recovery. It is no wonder then that at the present juncture the more sober analysts have ceased asserting that we are suffering merely from an overdose of pessimism engendered by the stock market collapse of 1929. Clearly the basic causes of our woes have been more pervasive than asserted by those psychologists who see no obstacle to a renewal of activity except the lack of sufficient courage and confidence by business leaders.

Why Currency Factors Are Held Responsible

In endeavoring to locate the most significant maladjustment of the present period our attention is directed first to the doctrine which holds that credit and currency conditions have been responsible for the recent declines in commodity prices. The prevailing interest in monetary factors is explainable on a number of grounds. In the first place the severest crises of our past history have coincided with banking catastrophes. Secondly, we now have powerful organizations dedicated to the principle of emphasizing the importance of money in all economic activities. Of more importance than either is the fact that in the estimation of the business public other influences have not been of sufficient magnitude to explain the present depression's world-wide scope.

Difficulties in Ascribing the Blame to Money

Monetary interpreters of the course of commodity prices in recent years have, however, been confronted with a multitude of perplexities. There have been a number of occasions in which commodity price movements have not shown any high degree of responsiveness to credit and currency conditions. To select two illustrations, the price recessions of 1924 and of 1927-1928 occurred during periods in which the credit supply of the country was growing at an excessively rapid rate. On the other hand, the sharp, though brief, commodity price advance of late 1928 took place at a time in which the reserve banks were operating to induce restraint in the market's use of credit.

Reverse relationships of this sort have made it particularly difficult for the adherents of the monetary school to provide interpretations of the recent movement of commodity prices which would be thoroughly satisfying to the general observer. None of us like to be told that these episodes were merely exceptions which prove the rule. Accordingly, the monetary theorist argues that a single country is too small a domain in which to determine the general influence upon prices of credit factors, that frequently the forces which lead to credit expansion for some countries may do more in the direction of compelling credit contraction for others. Prices of the more important basic commodities, so it is contended, are determined by world supply and world demand, and consequently such factors as gold movements must be visualized from the standpoint of their world influences.

Not Total Gold Supply but Its Distribution Is Important

Applying all this to the 1924 situation, when prices in this country tended to fall despite the immense gold imports, it is maintained that the movements of gold toward the United States did more to compel credit contraction abroad than it did to induce credit expansion here. In that year a large part of the gold consigned to us from Europe was employed by member banks to reduce their debts to reserve institutions and had relatively little effect except to enlarge the reserves of the reserve banks. For the time being and from a world point of view, so it is contended, this gold might just as well have been sunk in the sea.

But all this gets us into the field of inter-country banking relation-

THE WORLD'S GOLD



1924 into an outflow in 1925, and its easy money program in 1927 failed only because it was poorly timed.

The politician who rants at reserve policy merely because it seems to plant our banking resources abroad should be informed that the United States is a part of the world, in trade as well as in geography, Professor Reed declares. So long as we buy and sell from other countries we cannot be unaffected by currency conditions abroad and maldistribution of the world's supply of gold.

ships and in his justifiable perplexities the neophyte insists that we go back and examine the gold question in all its implications. To begin with he wants to know if there has been any real gold shortage in the world at large. He has been told by such authorities as Joseph Kitchin that we may expect a decline in gold outputs beginning about 1933. He understands further that, even with a stationary gold output, shortages must some time develop if production and trade in the various countries of the world continue past rates of growth.

But these facts and opinions seem to reach out to the future and do not seem to explain why basic prices have been falling so rapidly in the last year and a half. From what the average business man knows of methods of price fixation in his own enterprise, prospects of a general gold shortage five or six years hence could not explain in any very practical fashion the nature of the price movements of the last 18 months. It might be that anticipation of what is due to occur in 1935 or 1940 may have led central banking administrators to adopt restrictive devices in recent months. But all this is dubious indeed.

Despite this last bit of skepticism, however, our inquirer has not yet succeeded in shaking off the monetary interpreter of recent price movements. He is next informed that, despite the fact that there has as yet been manifested no aggregate shortage of gold in the various countries of the world, there is a sufficiency of proof that it has not been adequately distributed among the different nations. Under these conditions the strains upon the currency systems of some countries have not been proportionately offset by the surpluses of other countries.

A few nations, principally the United States and France, have succeeded in acquiring more than their share, but other countries, Great Britain, Germany, Italy, Brazil, Australia, and the rest have not had nearly enough. These latter nations have constantly been obliged to adopt various methods of credit repression in order to avoid departure from the gold standard. Not only have they been compelled to keep money rates high, but their industries have found it necessary in order to maintain their solvency to dump products abroad on whatever terms could be had. With the export industries of so many countries thus functioning, the whole world has become, so it is argued, a vast buyer's market. In the face of these general conditions no single country seems able to make any considerable headway.

By appealing in this manner to the international situation the monetary interpreter rests his case and against his conclusions demolishing arguments cannot be directed. Even if he is partially wrong, rebuttal would require more understanding of world conditions than most of us possess. And there is at least a good chance that this international explanation is correct in a very large degree.

Maldistributions of the world's gold stock clearly have had something to do with recent tendencies in prices. Whether the aforementioned currency factors have been as important causes of price-depression as technological improve-

THE author has been identified with university work in economics since 1914. In 1926-27 he undertook an investigation of the Federal Reserve system for the Chamber of Commerce of the United States. In this connection he worked with committees of the chamber and drafted the conclusions embodied in that organization's report on the subject. He has contributed numerous articles to scientific periodicals and to the financial columns of newspapers, and has published the following books: Development of Federal Reserve Policy (1922), Principles of Corporation Finance (1925), and Federal Reserve Policy, 1921-1930 (issued last fall). He is professor in the department of economics at Cornell University.

ments in industry, increased efficiencies of labor, cost-saving methods of market distribution, enhanced supplies of climatically-determined outputs of important raw materials, simply cannot be determined with precision. The problem is one wherein much depends upon personal bias and opinion. Nobody really knows a great deal about it.

Does Solution Require New Machinery?

Of much more practical importance, however, is the question of the remedy. Granted that world credit conditions have had something to do with the existing situation, what type of relief measures are desirable? Is the problem one in which adequate solution can be had by relying upon wise credit policies by the particular countries which have absorbed more than their share of the world's gold? If so, means of avoiding further difficulties are not beyond our reach. Or, on the other hand, must dependence be placed upon visionary projects involving international financial consortiums, extension of the powers of the new Bank for International Settlements, inter-country cooperation in economizing the use of gold for purposes of domestic circulation At the present time general opinion among economists seems to be reaching out toward the necessity of international action. But, on the other hand, inter-country policy may fail unless there is cordial cooperation on the part of those countries which are in the strongest gold position. Let us accordingly inquire as to what recent experience has disclosed regarding the practicability of depending very largely upon currency policies of particular countries which have attracted large amounts of gold from other countries.

Success of Reserve Policy in 1924

Nineteen twenty-four is usually characterized as the year in which our reserve bank authorities made the most vigorous efforts to resist drawing gold from abroad. In that year commodity prices tended to fall, outputs of leading industries were sagging, while the gold movement was in our favor. At this time it appeared to our banking authorities that rapid credit expansion at home could do little mischief. It would be unlikely to lead either to commodity price inflation or to the undue stimulation of productive activity. Even if cheap credit might create some mischief at home it would no more encourage inflation than the gold which otherwise might be imported in larger volume.

On the other hand, low money rates and abundant credit here would lessen the attractiveness of the New York market for foreign capital and furthermore would provide our investment market with funds which might be placed in part in foreign securities. The credits thus acquired by foreign nations might be employed to meet their obligations to this country and obviate the necessity of shipping gold to us.

So far as immediate results were concerned, only success seemed to attend these easing measures. The gold inflow of 1924 turned into an outflow in 1925, business recovery shortly developed momentum, and the sagging tendency of commodity prices was halted. It was only natural to expect that under substantially similar conditions in the future the 1924 policy would be repeated. Thus it came about that in the latter part of 1926 sentiment again began to crystallize in favor of repeating the policy of 1924. But at this time decisive action was postponed until after the mid-year of 1927.

Improper Timing of the 1927 Easing Measures

In 1927, however, the outcome was by no means so fortunate as in 1924. Undoubtedly the abundant credit generated at this time helped to encourage the speculative fervor to such an extent as to render difficult effective control by our banking authorities in the months following. Without going into this episode in detail it may be remarked in passing that the majority of banking economists would probably agree today that the saturated condition of the money market late in 1927 was more largely responsible than any other single factor for the development of the excessive degree of speculative enthusiasm which preceded the 1929 crash.

All this, however, does not thoroughly disprove the principle of the 1927 policy. In that year the execution of the easing measures was seriously at fault. It apparently took so long to convince various reserve authorities of the desirability of easing measures at this juncture that by the time action was undertaken the situation had completely changed. During the first half of 1927 the gold movement was toward this country. In the latter half of the year, however, the period which witnessed the discount rate reductions, the gold inflow turned into an outflow and thus maintained itself during the early months of 1928.

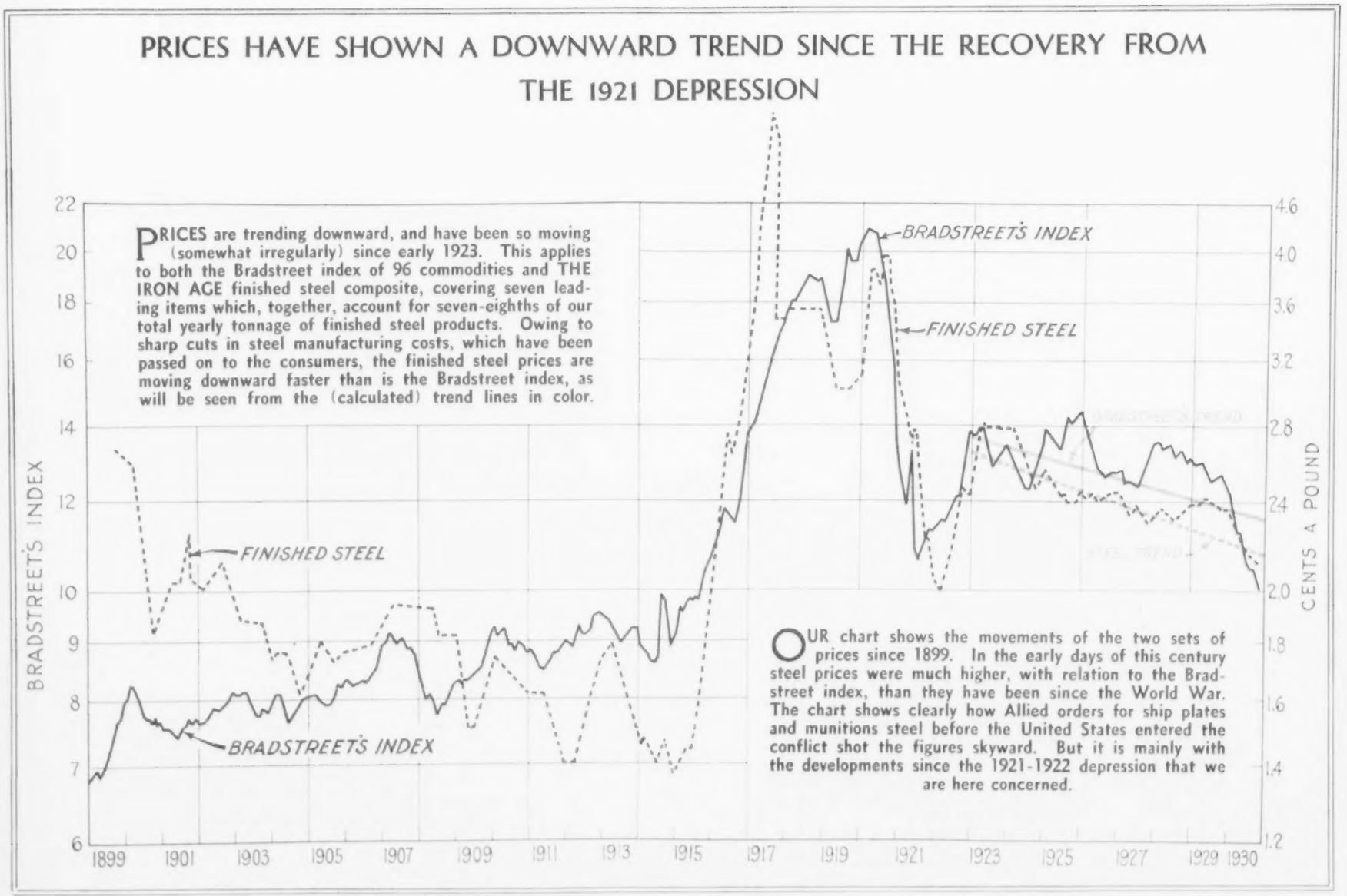
Delay in the easing measures led to their application at a time when they were no longer necessary. And they were conducted to such an extent as to more than offset the influence of the gold exports. Inflation had to manifest itself somewhere and as the situation developed the principal outlet proved to be the security markets. Decisive credit checks in early 1928 might yet have brought the situation under control, but the system then lacked either the courage, the insight, or the freedom from outside pressure to put them into operation.

Responsibility of Large Holders of Gold

If our interpretation of these two periods is at all accurate the absolute ineffectiveness of action by individual countries to avoid receipt of an unduly large share of the world's gold has not yet been demonstrated. Conversely, past experience does not clearly prove that for the effective regulation of gold flows we must rely upon such ambitious projects as to endow some super-international organization with supreme power. Nothing has yet been established except that the timing and the execution of our central banks' operations must proceed with greater precision than in 1927.

But how can these desired administrative improvements be assured for the future? For one matter there must be less public opposition to reserve bank policies which are suggested by international considerations. As long as we buy and sell from other countries we cannot be unaffected by currency conditions abroad and by maldistributions in the world's supply of monetary gold. The politician in high office who rants at reserve policy merely because it seems to plant our banking resources abroad, because in other words it smacks of trans-oceanic banking, should be informed by his business constituents that the United States is a part of the world, in trade as well as in geography. Within the system, reserve directors and officers should endeavor to keep up with developments mentally so that a policy such as that adopted in 1927 will not fail because it comes to be executed at a time in which conditions are the very reverse of those which were originally responsible for the policy's inception.

PRICES HAVE SHOWN A DOWNWARD TREND SINCE THE RECOVERY FROM THE 1921 DEPRESSION





EUROPE BESET BY ECONOMIC AND POLITICAL UNREST

By CHARLES M. MILLS
Industrial Counsellor, New York

THIS review of business, economic and political conditions in Europe, as they affect the rest of the world, was gathered in the summer and early fall of 1930, supplemented by information since received from representative industrialists and others.

There is no pretension to exhaustive analysis, but special attention was given by the writer in his travels to the unemployment situation in England and Germany and to unemployment insurance, costs and proposed reforms.

Existing conditions in principal European countries are described in the paragraphs below.

France

FIVE years ago France was still recovering from the throes of war. The franc was unstabilized, American debt negotiations had failed, domestic financial conditions were disturbing. Today, after being in the demoralized nations of central and southeastern Europe, the traveler returns to France with a feeling of relief. The franc has long since been placed on a gold basis, the Young plan established, the industrial sections of the country such as Lens, Lille and the Saar thoroughly rehabilitated. On Oct. 31, gold holdings were $1,992,000,000, compared with $1,570,000,000 a year previous.

On the other hand, there were strong indications at the close of the year that the boom of the last two years was ending, and that France was headed for depression. Business declined sharply in November. The Oustric bank failure and other crashes in November, followed by the fall of the Tardieu government on Dec. 4, have led to a feeling of instability and pessimism. Yet it seems improbable that France will fall into the severe depression found in other countries for three reasons: First are her immense gold reserves; second is the shortage of native labor and presence of 2,000,000 reexportable foreign workmen, preventing domestic unemployment; and, third, there is the inherent conservatism of the French toward violent industrial expansion.

France has done a splendid job in the Saar with her army engineers at the helm, but there is no possible hope that the plebescite in 1935 will result in a French victory. The vital statistics reveal a population more than 80 per cent German. With the loss of this territory and the revamping of custom walls, the cost of raw materials to French steel manufacturers will rise. It is understood from confidential sources that the Germans have already attempted to bargain with the French government for a return of the Saar prior to 1935 on the basis of an equitable tariff settlement. The situation is complicated by the heavy investment by the French in properties in the basin. Even the Germans might be embarrassed by the return of the basin by a glut of raw materials on the domestic market. They must find a convenient export market, and France is the logical country to deal with.

Disturbances occurred in the summer in the northeast of France particularly at Lille and Roubaix, over demands for higher wages and resistance to the new social insurance act which became effective July 1. France, the most backward of all European nations with regard to social legislation, finally adopted a law covering sickness, accident and invalidity insurance, and increased former provisions covering pensions. It is estimated that the average contribution toward carrying out the provisions of this law will amount to 5 per cent of the payroll for the employer and 5 per cent from the pay envelope for the worker. Experts agree that the probable increase in the cost of living, as a result of the law, will be about 2½ per cent, and presumably there will be relative wage increases. Wage scales in general are far below those in England and Germany.

The Italian situation, including the second disagreement as to naval ratios, is an irritating factor in the international picture. On the whole, though, France, one of the few comparatively self-con-

tained countries in Europe, is now occupying a much more powerful and secure position than five years ago.

Belgium

IN general, conditions in Belgium are fairly similar to those in France. With low wage scales, with huge quantities of raw materials close at hand, with many large plants entirely reequipped since the war, she has been able to undersell competing nations in iron and steel. Thus, she has been a disturbing factor in the attempt to work out an international steel syndicate.

Switzerland

SWITZERLAND has continued to be one of the most expensive nations in regard to cost of living. At the same time she has felt the loss of tourist patronage ever since the war. This has been especially true in the past summer, when Switzerland gained only a small percentage of the throngs going to the Passion Play just across her borders.

While the writer was in Geneva, a mass meeting of watchmakers was held to protest against our large tariff increase on Swiss watches. It is understood that two of the largest watch factories have had to curtail their operations severely.

Italy

THE power of Mussolini has strengthened vastly. While one may disagree with some of the methods used by the Fascisti, any fair observer must admit the substantial gains made by the government. The people are really working hard for the first time in their lives; the "Red" threat has been removed for the time being at least; sanitation has improved; the country looks and "feels" cleaner and neater.

Deposits in government savings institutions have increased from $270,000,000 in 1920 to $850,000,000 in 1930. Unemployment on Nov. 1 stood at approximately 450,000, of which 119,000 were women. Business in the fall months slackened, though there are signs of revival. The recent reduction of 12 per cent in government salaries is being watched with interest.

The peril of the present position lies in the ambition of international expansion. While much of this kind of talk may be termed as vapid, nevertheless, it is threatening the peace of central and southeastern Europe. If the traveler takes a trip through the French Riviera, the Austrian Dolomites, or Jugoslavia, he will find plenty of evidence for this statement.

Austria

TODAY it is hard to classify Austria as a nation. In reality it is merely a city of 2,000,000 people set down in a small mountainous country. The situation in Vienna, bad as it was a few years ago, is far worse today. The lack of raw materials, except wood and salt, the limitation of exports under the Versailles Treaty and the surrounding high tariff walls present an almost impossible situation.

Almost every form of socialistic legislation is in force in Vienna. There is a strong and well organized Communist group. Unless there is something done in a strenuous way to tide reckless expenditures, Austria is headed for severe disturbances.

There apparently is no desire to link up again with Hungary, and union with Germany is discussed less. The defeat of Fascist extremists in the recent election is significant. But the situation seems desperate, because, under the present map of Europe, it apparently can never get better.

Hungary

THE visitor is impressed with propaganda everywhere for the restoration of Hungary's former power. There were rumors in October relative to the restoration of the monarchy to Otto, who became 18 years of age in that month. One group believed that the country would be "just as well off" with an occupied throne than with an empty regency. On the other hand, there is considerable opposition to Queen Zita on the basis that Hungary as a nation means little to her and that her ambitions lie in a partial resumption of the Austro-Hungarian empire. Such an attitude is hopeless, these critics say, because of the activity of the Austrian monarchists and the pro-German party.

Budapest had her fill of Bolshevism in the days of Bela Kun, and the mere mention of his name runs a shiver down the backs of the average native. But, after finally overthrowing the Bolsheviks, she created an extreme socialist government. Hungary had tried to make up for her loss of raw materials by establishing state enterprises such as an automobile factory, an automatic canning plant, etc. These have dismally failed.

Under the able leadership of Jeremiah Smith of Boston, who for several years administered the loan of "rehabilitation" by the League of Nations, Hungary was well on the road to recovery financially. His firm hand kept the government officials from unwise expenditures. Since his retirement, Hungarian finances have sunk to new low levels. The government, engaging in speculative state enterprises, has lost ground consistently. The Hungarians as a business people have proved signally unsuccessful.

Czechoslovakia

THE energy of the new republic is evident. Having inherited 85 per cent of the industrial area of imperial Austria, she has

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UNSETTLEMENT in Europe is caused by many factors. There is the burden of unemployment, with more than 8,000,000 idle in all countries; social insurance laws, invoked chiefly by socialist governments, placing heavy taxation on the states, employers and workers; inefficient financial administration, particularly in Austria and Hungary; fear of Soviet Russia and its policy of alleged "dumping" of products; recurrent war clouds; the disturbance in international relations caused by retaliatory tactics against the present American tariff; the widespread discussion and propaganda regarding the payments of war debts to the United States.

Notwithstanding these many disturbing factors, the author feels it probable that European countries are passing through the final phases of the depression. Slight improvement is already noted, chiefly in exports, and it is predicted that slow gains will follow, with perhaps substantial gains in the fall.

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capitalized heavily on the original investment. In contrast with the dreaminess of Vienna and Budapest, Prague is a bustling, metropolitan center, now the headquarters of distribution in central Europe. She is carrying on excellent advertising and propaganda in attracting tourists.

Because she is comparatively efficient, Czechoslovakia is cordially hated by her jealous neighbors, and, in turn, she seeks protection with one of the largest standing armies in Europe. In addition to a large army, there is a second army of governmental employees used to enforce advanced social legislation. The country stands next to Germany in this regard. Because of military and civil service costs, governmental expenditure is high. Czechoslovakia apparently needs more business in government. Nevertheless, she is going ahead steadily, with other nations becoming more and more envious.

Poland

A NATION of more than 35,000,000, of which only a small percentage can read and write; predominantly agricultural, but growing more industrial; a so-called republic, but in reality and for practical reasons a military dictatorship—this is Poland.

The Versailles Treaty made Poland, but also planted vexing problems on her doorstep. The Polish corridor, separating East Prussia from Germany and making Danzig a free port, has undoubtedly given another Alsace-Lorraine to the world.

Poland has done well in reorganizing her coal and salt monopolies with modern management methods. She has most able financial guidance under Charles S. Dewey. The recent elections strengthened the power of Marshall Pilsudski, who is expected to direct internal economic consolidation and firm but moderate policies toward Germany and Russia.

Russia

IT is difficult to summarize conditions in Russia; the observer must analyze sources, influences, propaganda. Briefly, the situation may be analyzed as follows:

The entire country is working with zealous fervor to complete the five-year program. Sacrifices are being made of necessary raw materials for the sake of exports, which in turn may be converted into gold.

Analysis of progress under the five-year program depends largely on the source and quality of statistical data. Evidently substantial gains have been made on farm collectivism, in steel and agricultural implement plants, and in oil production and refining.

Production has usually run far behind contemplated quotas in new plants, owing to the lack of capable management. Engineers and others are hired from foreign countries on excessively high contracts, thus increasing costs.

The effect of exports, produced on the Soviet basis, is felt in all countries, with resultant charges of "dumping." The full results of this policy have not yet begun to be realized or even estimated.

The party in charge of governmental policies is as strong as ever. Each year strengthens its power.

Unemployment insurance has been revoked, and all idle persons put to work on public improvements.

Germany

THE recent elections, domestic business conditions, and the reparation payments under the Young plan are indissolubly linked together. In the period since the September elections, although there have been constant threats from the Fascists under Hitler and the Communists, Chancellor Bruening has won two signal victories in succeeding to force far-reaching fiscal and economic agenda through the Reichstag. In addition, a most significant effort is being carried on to reduce the cost of living along with wage cuts. While the cartels are making every effort to maintain prices or check declines, costs are being reduced. Bread has been cut from 12c. to 11c., with an estimated saving of $23,000,000. Wholesale meat prices have been reduced 20 per cent, with saving on pork alone estimated at $40,000,000. Prices on building materials in Berlin have fallen as much as 35 per cent for tiles. If Bruening can win through on parallel wage and price reductions, he will emerge as the strong man of the hour, and the center parties will continue to hold the reins of government.

On the other hand, the economic situation is bad. Germany has probably been as hard hit by world-wide depression and the slack in domestic consumption as any nation—surely as much as any nation on the Continent. She had 3,253,000 unemployed out of 18,000,000 workers on Oct. 31, with more than 600,000 in the "crisis" group, who have to have their regular benefits extended. She cannot let these people starve. She faces a strong Communist element, both German and Russian.

There are expert observers who see in the rapidly mounting costs of social services, especially unemployment, a well disguised effort to show Germany bankrupt, and thus unable to meet her obligations under the Young plan. There is no doubt of widespread abuses under socialist legislation. But concerted propaganda of this nature, upon a nation-wide basis, would be exceedingly difficult of execution. Then, too, to run up social insurance costs intentionally—say, for example, unemployment—would ultimately affect her credit standing before the world. The last thing that Germany wants is curtailment of credit. She needs every single dollar of credit she can obtain. To show bankruptcy intentionally would be the worst thing she could do in the final analysis.

German industrialists deny even that a moratorium—say for three years—would affect the picture fundamentally. While morale would be restored for the time being, they claim the resumption of payments would still be in the background. More likely, they say, is further adjustment of the plan of payments under the Young plan.

The worst feature of the situation observed in various parts of Germany is "beggar psychology." The loss of man power, of territories, of colonies, of shipping, of international trade, made them (they say) a ruined nation; to recuperate, help must be given. They claim that impossible and fantastic reparations are out of the picture, that payments must be reduced so that more capital can be freed for domestic purposes, which in turn can be converted to exports and international trade. Thus the psychology of the mendicant remains. It permeates not only the employer group, but trade unions and the working classes. It has bred "dole-itis," which, from an individual point of view, is the attitude that it is better to take the dole than to work; and, from the governmental point of view, is the attitude that it is easier to vote huge sums for the dole than to analyze and study ways and means of unemployment prevention.

Nevertheless, with all the difficulties in Germany, there is a

fundamental belief that the commonsense, dogged, patient attitude of the average citizen will win in the end. With our stake in the Young plan, in the billions of our post-war investments, in international trade, Germany must not be allowed to fail in setting her face toward more complete economic recovery.

England

THE most depressing picture in any country is found in England. The latest reports show more than 2,280,000 unemployed in Great Britain. Of these, 1,650,000 are men, 60,000 boys, 518,000 women, 50,000 girls. Approximately 1,650,000 are wholly unemployed, 521,000 are temporarily out of work, and 105,000 normally engaged in casual labor.

During the Parliamentary session of 1929-30, four changes have liberalized the unemployment insurance law. The government's share in the tripartite contribution (employer, worker and the government) was raised to 50 per cent of the total contributed by employer and worker. This is the highest percentage in the history of the law. Increases were made in benefits paid to persons aged 17, 18 and 19, and in the rate of benefit for adult dependents. The provision was repealed that "a claimant must prove he is genuinely seeking work, but unable to obtain suitable employment." This action paves the way for further abuses under the law. The limit on Treasury advances to the unemployment fund was raised three times, once to £50,000,000, on Aug. 1 to £60,000,000, and on Dec. 1 to £70,000,000.

The amount of debt of the unemployment fund on Dec. 31 of each year—1921 to 1929—is shown below:

Dec. 31, 1921.....	£7,600,000
Dec. 31, 1922.....	15,613,480
Dec. 31, 1923.....	12,497,054
Dec. 31, 1924.....	5,093,549
Dec. 31, 1925.....	7,262,569
Dec. 31, 1926.....	22,640,000
Dec. 31, 1927.....	23,180,000
Dec. 31, 1928.....	31,720,000
Dec. 31, 1929.....	37,850,000

It is estimated that unemployment insurance now costs £107,000,000 ($535,000,000) a year, of which the employed pay $70,000,000, the employers $80,000,000, and $385,000,000 by the state through taxation. Of the total cost $110,000,000 is paid in "transitional" benefits as straight relief to those not qualified actuarially under the law. It is said that there are now 500,000 persons receiving the dole who would have been excluded under provisions existing prior to the act of 1930. The whole question has been shelved into the hands of a royal commission by vote of Parliament in December.

ENGLAND, facing one of the most depressing situations in all of Europe, is awaking to the need of a complete revamping of her industries and trade. Protectionists seem to be gaining ground against the free traders, with the possibility that in the end Mr. Baldwin's partial protection program may win.

The fall meeting of the Labor party in October did not produce any practical unemployment insurance reforms. The proposals included the advancement of compulsory school attendance to 16 so as to postpone entrance into industry; the reduction of compulsory retirement from 65 to 60 years of age under the national pension act so as to eliminate the oldest group (and supposedly the most unfit group physically) from unemployment insurance privileges. Fundamentally, these propositions do not reduce total net national expenditures, and in addition, might work hardship on innumerable family budgets. The third proposal was to take over agricultural lands to give work to the unemployed.

The original idea of the first unemployment act in 1911, admirably conceived, was to afford relief not otherwise available to a small group of workers in stable industries. Primarily the act was to avoid the threat of starvation. The inclusion of munition workers in the 1916 act and the general act of 1920, covering almost all industrial workers, was to provide for men and women who were engaged in war service. Primarily the latter act was to avoid the threat of social revolution. In these two ways, unemployment insurance in England may be termed successful.

But the trend since then has been away from such practical issues toward political bargaining. The law has been amended according to the political weather-vane. Sometimes benefits and contributions were raised, sometimes lowered. Relief to those who had exhausted their regular insurance rights, and relief or dole to those who were never strictly eligible to such privileges are tacked on to insurance. The law lost any semblance to orderly actuarial methods.

Originally, an unemployed person could draw benefits for 15 weeks only. Now he continues indefinitely on the dole. In the beginning, the unemployed had to appear before local boards and prove genuine intent to find work; now no such procedure is necessary. Originally, the law looked toward an actuarial basis for differentiation of unemployment risks in different industries. Today this has been completely forgotten. The trend is altogether toward relief, not prevention.

Conversation with industrialists, bankers, trade unionists, and others in England seemed to reveal one common thought, namely, that England must revamp her industries and trade to the needs and demands of the times. She too long has taken the attitude that things would continue to be; that they would "muddle through." To illustrate, one steel equipment manufacturer told of selling one of the largest and most modern mixers to an old mill. Six months later the firm failed because "they didn't realize a patch on the pants could not make a new pair of trousers. They needed not a patch, but a whole new suit of clothes." Just so. England needs thorough industrial rehabilitation.

The protectionists, on the whole, seem to be gaining ground on the free traders. The Imperial Conference, which cannot be termed a howling success, brought out the difficulty of "favored" free trade with the colonies. But, perhaps, in the end, Mr. Baldwin's partial protection program will win.

England faces huge international problems in her colonies, all recognize. Just how these basic relationships may be worked out remains to be seen. In the strain and stress of colonial administration rests the future of England's power and prestige.

All these problems—economic, social, industrial, international—call for super-political leadership. The horizon today seems clear of the right kind of such guidance. Perhaps the next election may bring forth a Moses to lead England out of the present morass.

WHAT ARE THE FACTS ON THE

AVERAGE rate of duty under Hawley-Smoot act is 40 per cent, compared with 33.22 per cent under the Fordney-McCumber law, according to Tariff Commission summary based on imports in 1928.

Greatest increases were in the agricultural schedule, the average rate for which rose from 19.86 per cent to 33.62 per cent.

In the metal schedule the average rate of duty showed only a slight increase, rising from 33.71 to 35.01 per cent.

Of the 176 groups in the metal schedule 28 were given slight increases and 10 moderate reductions.

Among raw materials, 10 to 30 per cent manganese ore, previously duty-free, was given a rate of 1c. per lb. of contained manganese.

Retaliatory advances by foreign countries are not proving so serious as was feared and in some cases have been followed by downward revisions.

Raising of tariffs to foster home industries was in progress in certain countries before the Hawley-Smoot tariff was framed. This policy is causing more apprehension than efforts at retaliation.

Tariff Commission is in a position to conclude investigations more rapidly than formerly and now has the authority to recommend changes in rates.

TARIFF legislation in the United States always is accompanied by a barrage of criticism and defense. Because it is a political and economic issue of world bearing, it is given acute attention in political and business circles all over the globe. If foreign countries are dissatisfied with the legislation, threats of retaliation are made and oftentimes put into effect. While history will show that retaliatory measures are not nearly so serious as represented by critics of the legislation, they sometimes do disturb international markets, as least temporarily.

Lack of Clear Understanding

The Hawley-Smoot tariff act, which became a law on June 18, 1930, like it predecessors, ran the gamut of universal discussion. It will continue for sometime to arouse argument both at home and abroad, and be an outstanding issue in future political campaigns in the United States. Conflicting views are fired back and forth with such rapidity that the public, if it pays any heed to them, naturally is left in a state of confusion. Broadsides against and for the act which are meant for public consumption for the most part are so general that it is not possible to get an accurate picture of how it compares with former tariff laws. Even in business circles there is not a clear understanding of the situation, except where careful study has been given to the subject.

For this reason an analysis of the new law at this time may be of value. Only limited comment will be given to the law as a whole, while particular attention will be paid to the metal schedule. Comparison will be confined to the present act and its immediate predecessor, the Fordney-McCumber law, enacted Sept. 22, 1922, during the Harding administration. Both laws being sponsored by Republican administrations, they are protective measures.

Greatest Increases in Agricultural Schedule

First, for general comparison, a summary prepared by the United States Tariff Commission, based upon imports during the calendar year 1928, and computing rates in ad valorem terms, shows that the average rate of duty in the Hawley-Smoot act is 40 per cent, while the average rate in the Fordney-McCumber act was 33.22 per cent. Dutiable imports for the year totaled $1,358,173,821, while the value of goods entered free of duty was $214,978,206, making a grand total of $1,573,152,027. Duties collected in 1928 aggregated $522,648,984, while the estimated total that would have been collected under the present law is $629,220,236. These figures do not include non-comparable items, importations of which in 1928 were valued at $40,768,502.

The greatest increases in duties in the Hawley-Smoot act were in the agricultural schedule, the average comparable rate rising to 33.62 per cent from 19.86 per cent an increase of 13.76 points. The smallest increase was in the rayon schedule, which was raised to an average of 53.62 per cent from 52.68 per cent, a difference of 0.94. Next came the flax, hemp and jute schedule, which was increased to 19.14 from 18.16 per cent, a difference of 0.98. The third smallest increase was in the metal schedule, which now carries an average rate of 35.01, increased from 33.71 per cent, a difference of 1.30.

Advance in Metal Schedule Is Slight

Dutiable imports under the metal schedule in 1928 were valued at $117,838,584, and duty-free imports

HAWLEY-SMOOT TARIFF?

By L. W. MOFFETT
Washington Editor, The Iron Age



at $820,124, making a total of $118,658,708 for comparable items. Duties collected under the metal schedule on comparable items were $40,003,722, while the computed collection under the present act is placed at $41,538,921. Non-comparable dutiable items in the metal schedule were imported to the value of $11,762,717. Duty-free imports under the present law, computed on the 1928 basis of imports, are estimated at a value of $253,544.

There are approximately 176 groups in the metal schedule, of which 28 were given slightly increased rates, while 10 were given moderate reductions. On the hot-rolled tonnage products, such as plates, shapes, bars and sheets, the average rate in the new law is 25.25 per cent, comparing with 24.88 per cent in the Fordney-McCumber act. This fractional increase was due solely to the fact that hollow drill steel was for the first time mentioned by name and given a specific duty of 2.45c. a lb., equivalent to an ad valorem rate of 36.03 per cent, as against the former rate of 1.7c. a lb., equivalent to 25.33 per cent.

Duty Imposed on Lower Grade Manganese Ore

In the alloy ore and ferroalloy paragraph, embracing numerous items which the hot-rolled and alloy steel industries purchase as raw materials, the average rate of duty was increased to 73.64 per cent from 70.16 per cent. There were four changes in this paragraph, two upward and two downward. Manganiferous iron ore, containing 10 to 30 per cent metallic manganese, was made dutiable at 1c. a lb., based on manganese content, while previously this grade of ore was duty-free. The present duty is equivalent to 91.04 per cent. This change was brought about as the result of the vigorous fight centering in the successful efforts of the American Manganese Producers' Association to reduce the limitation on dutiable manganese ore from 30 to 10 per cent manganese content. The other increase in this paragraph was applied to tungsten ore, now dutiable at 50c. a lb. tungsten content, equivalent to 212.44 per cent, as against the former duty of 45c. a lb., equivalent to 191.19 per cent. One decrease in duty was applied to ferrochrome, containing 3 per cent or more carbon, made dutiable at 2.5c. a lb., chromium content, equivalent to 25.16 per cent, as compared with the former duty of 3.5c. a lb., equivalent to 35.22 per cent. The other decrease related to chrome metal, reduced to 25 from 30 per cent.

Changes in Alloy Steel Paragraph

Among the most important changes made in the schedule were those pertaining to alloy steels. The duties of 65c. and 72c. a lb. were continued, but, in recognition of the development of the alloy steel industry, the limitations on the alloy content were altered so that lower grades of alloy steel have been brought within the paragraph. The change is in the nature of an adjustment, the revision of compensatory duties being unimportant.

Another change made was the elimination of the brackets carrying duties on steel valued at less than 1c. a lb. This was done at the request of the American Iron and Steel Institute, which contended that there is no such thing as steel valued below 1c. a lb. It was pointed out that the old brackets permitted undervalued entries of imports and made dumping possible. This change was in line with one of the principal ideas framers of the new metal schedule had in mind —reclassification and systematization so as to reconcile the schedule with growth of the industry and also to clear up administrative questions arising from Treasury decisions as to applicable duties.

Certain Products Mentioned for First Time

Reflections of this purpose other than those denoted are seen in the naming of certain products for the first time. Among these products, in addition to hollow drill steel, already mentioned, are sponge iron, sheet piling and concrete reinforcement bars. Sponge iron was placed in the so-called pig iron paragraph and given a duty of $2.25 per ton, exactly twice the pig iron duty. Previously, sponge iron was covered in the earthenware

schedule with a duty of 30 per cent, equivalent to $9 a ton. Sheet piling was put into the beam paragraph and given a duty of 1/5c. a lb., or 20c. per 100 lb. This item had been a source of contention in customs cases as to classification and was finally held dutiable at $4 a ton, the present rate. Concrete reinforcement bars also had been a source of contention as to classification. They were put in the so-called steel bar paragraph and made dutiable at ½c. a lb. when valued above 1.5c. and not above 2.5c. a lb., and at 0.3c. when valued not above 1.5c.

COMPARISON OF METAL SCHEDULE RATES IN THE TARIFF ACTS OF 1922 AND 1930

(The equivalent ad valorem rates are calculated from the quantity and value of imports in the calendar year 1928)

Paragraph	Commodity	Actual or Computed Average Rates Act of 1930 Per Cent	Act of 1922 Per Cent
302	Alloy ores and ferroalloys	73.64	70.16
303	Wrought iron, semi-finished and finished	22.79	22.79
304	Steel ingots, blooms, billets, etc	25.89	22.33
304	Steel bars	26.40	24.49
304	Steel bars, over 0.6 per cent of alloying element	33.22	33.22
304	Sheets and plates	23.53	23.53
304	Sheets and plates, over 0.6 per cent alloying element	28.50	28.50
304	Circular saw plates	23.78	23.78
304	Circular saw plates, over 0.6 per cent alloying element	32.50	32.50
305	Alloy steels	28.34	26.66
309	Galvanized iron and steel, including sheets, etc.	23.91	23.91
310	Tin plate	13.53	13.53
312	Structural shapes	15.19	15.19
313	Hoops, bands, etc	21.35	21.35
314	Cotton ties	13.03	13.03
315	Wire rods	13.15	13.15
329	Chains	38.26	34.61

Cast Pipe Duty Raised

The duty on cast iron pipe was increased to 25 per cent from 20 per cent. On autoclaves, increases were made from various rates to 35 per cent.

Included in items transferred to the free list are hoes, forks, rakes, metal parts of typewriters, and muzzle-loading shotguns. An item produced by by-product coke ovens of the iron and steel industry which was transferred to the free list is ammonium sulphate, formerly dutiable in the chemical schedule at ¼c a lb.

Both Increases and Decreases in Machinery Items

Both increases and decreases were made in duties on machinery items. Steam turbines were increased to 20 per cent from 15 per cent; machinery, electrical equipment, to 35 per cent from 30 per cent; punches, shears and bar cutters to 40 per cent from 30 per cent; cotton manufacturing machinery to 40 per cent from 35 per cent, and wool and other textile machinery to 40 per cent from 35 per cent. On internal combustion engines and machines not specially provided for, duties were reduced to 27½ per cent from 30 per cent, and on printing presses a reduction to 25 per cent from 30 per cent was made. The duty on machine tools was continued at 30 per cent.

At the request of industry, the duty on automobiles was reduced to 10 per cent from 25 per cent. In retaliation for increased duties on products imported from France, that country raised duties on American automobiles. These duties were applied to the cheaper cars and though our automotive industry showed considerable concern about them, they are not proving so effective as was feared.

This same observation may be made with respect to action taken by different countries in raising duties on iron and steel and machinery items. Some of these changes have been followed by further revisions, which have given United States producers an advantage rather than placing them at a disadvantage with perhaps certain exceptions such as those relating to agricultural and other machinery. The raising of tariffs by some countries, as a matter of fact, was in progress even before the new tariff law was being framed and reflect an effort on the part of different countries to build up their own iron and steel industries. It is this development which many think will have a greater effect on American steel exports than will any efforts at retaliation.

The iron and steel section of the basket clause in the Hawley-Smoot act carries a duty of 45 per cent, increased from 40 per cent. Imports under this clause normally are estimated at approximately $9,000,000 annually. Based on the value of imports this increase in duty is expected to raise more revenue than will be brought about by any other changes in the metal schedule.

Machinery of Tariff Commission Speeded Up

Perhaps the outstanding administrative changes made in the new tariff act relate to the flexible provision and powers of the reorganized bi-partisan Tariff Commission with a membership of six, headed by Henry P. Fletcher of Pennsylvania.

Under the flexible provision as amended it is expected to conclude investigations and make recommendations much faster than was possible under the old provision. This is due to the fact that much, though not all, field work heretofore performed by tariff experts will be done away with, as will investigations abroad calling for examination of books of foreign producers as to costs. Instead of having to gather much material through field work of domestic producers, both the latter and the importing interests now are required to prepare pertinent information in connection with cases in which they are interested and file it before hearings are set. Where additional material is wanted by the commission it may send experts to get it. In gathering data on costs much more reliance will be placed than previously on average invoice prices or values of both domestic and foreign goods for a representative period as well as "other relevant factors that constitute an advantage or disadvantage in competition."

This is held to provide a realistic view of the problems of interna-

(Concluded on page 77)



BASIC INDUSTRIES NEED WIDENED MARKETS

By EDWIN C. ECKEL

MOST very early temples and other great structures were built of stone, and for the past 2000 years at least, usually of stone cut and laid with great accuracy. We may fairly say that even as late as the discovery of America the use of any cement or mortar to hold the stone together was frankly unusual; where we do find lime or plaster or the early volcanic-ash cements used the purpose was rarely to add strength, but to secure a smooth plastered surface on the interior. The Romans, encouraged by the local deposits of volcanic ash around Vesuvius, did use a true waterproof cement (puzzolan cement) in bridge piers and aqueduct linings; but there is no proof that the practice extended to their dominions outside of Italy. And during all of the Middle Ages the great cathedrals and fortress-castles were built without any necessary use of cement, dependence for strength being placed upon the perfection of the stone-cutting and stone-laying. Meantime the use of iron in engineering works was also almost non-existent; and in more purely architectural constructions we find it employed almost exclusively because of its ornamental possibilities, as displayed by doors, grilles, etc., worked in wrought iron.

Beginning only a very few centuries ago, this situation changed very markedly, in favor of iron at first, and considerably later in favor of cement. The introduction of the blast furnace was the first step in the line of making iron, not a scarce ornamental metal, but the cheapest of commercial metals; the utilization of coke as a fuel in place of charcoal was the second; the relatively late introduction of the hot blast was the third. The last two of these took full effect (except in America) during the half-century 1780-1830; and from that last date onward there has never been any limit to iron output except purely business considerations.

Cement, meantime, had come into its use at about the same period. Its arrival was clearly a case of a new demand being met by discovery and invention, for the great period of port works, lighthouse construction and canals which marked English, European and American progress in the years 1750-1830 brought with it a clear necessity for a cementing material which would set and harden under water. The natural cements discovered around 1790 in Europe and from 1818 onward in America were an obvious response to a new demand; the Portland cement of Vicat (1818, France) and Aspdin (1825, England) was an improvement which was destined to take up the greater portion of the new field.

Since around 1830 the iron industry has seen two great improvements which have immensely increased its field of use—the invention of the first large-scale steel-making process, the acid Bessemer, around 1855—and the invention of the two basic processes from 1864 to 1878. Now we seem to be facing a third great change, which is in the direction of improving quality rather than of increasing tonnage—the discovery and increasing utilization of the alloy steels and related products.

During the same period of a century the cement industry has increased strikingly in mechanical perfection and in tonnage. The two important extensions of its use were the employment of mass concrete or beton, commencing around 1840-60; and the rise of reinforced concrete or concrete-steel construction, say from 1880 onward importantly. And, again as with iron and steel, during recent years we have seen the beginning of attempts at far greater perfection of quality and of utilization along new lines. So with this attempt at outlining a background for the two great industries, we may turn to consideration of their present relative importance, in tonnage and otherwise.

Great Growth in Use of Cement and Iron

It is difficult to comprehend the importance of the iron and steel industry today unless we look back to periods when iron was more or

INCREASED demands for both steel and cement will develop when prices are still relatively low.

The next period of heavy increase in output will not come until incited by the necessity for supplying new markets.

Lower fixed charges and lower overhead will permit earnings to show up surprisingly well, despite low prices.

A period of falling prices places a premium on economy, efficiency and intelligence, as contrasted with booms, which are favorable only to speculative abilities.

The steel industry is more secure against new competition than the cement industry.

The ratio of cement output to pig iron production has risen from 50 per cent in the last pre-war year to about 67 per cent in the recent boom years.

less of a luxury. In 1930 every inhabitant of the world has an average supply of close to 100 lb. of iron annually; and the United States output, in our last record year, averaged some 700 lb. per capita. As compared with this we know that as late as 1800 the world average was only 2 lb. per capita; and that in 1750 it was less than a third of a pound. To make the comparison as broad and striking as possible, we might compare a current annual output in the United States of say 700 lb. per capita with the fact that when Imperial Rome was at its maximum of prosperity, the inhabitants of Rome itself probably never had on the average one pound of iron apiece during their whole lifetimes.

Ratio of Cement to Iron Output Has Increased

For several years past, representing the final height of the post-war boom, the world output of pig iron has averaged a little under 95,000,000 metric tons. As compared with this iron basis, we have estimates of world cement output during the same period which suggest that the average cement tonnage was around 67,000,000 metric tons. The cement production of the world is, therefore, running at about 70 per cent of the pig iron output in tonnage. For the United States, where late and accurate figures are available, we may compare a record output of 41,757,215 gross tons of iron in 1929 with one of 28,800,000 gross tons of Portland cement in the same year—with a result almost precisely that secured when we compared world outputs for 1927-8-9. The United States cement tonnage was, during 1929, 69 per cent of its pig iron tonnage; if we include all the ferro-alloy output with the pig iron, then the United States ratio is still around 67 per cent—in any case slightly over two-thirds of the iron output. I am stressing this point, not merely because of its local importance, but because the American figures as to both cement and iron are certainly far nearer the truth than are any possible world estimates.

Going back to a pre-war year for a time and growth comparison, we find that in 1913 the United States output of Portland cement was, stated in iron language, 14,455,000 gross tons. This compares with an American pig iron shipment of 30,388,000 tons in the same year. At this last pre-war date the cement-iron ratio in the United States was, therefore, only 47 per cent. And if we compare again on a world basis, we find in 1913 a total iron output of some 78,000,000 metric tons against a world cement output of slightly over 39,000,000 tons—in this case, using less certain data, a ratio of 51 per cent.

So whether we use the narrower but more exact American base, or the world base, we come to pretty nearly the same comparisons as to ratios and times; in the last pre-war year the cement output was half that of pig iron; today it is over two-thirds. The great increases in cement growth have not been accomplished at the expense of iron, however; they are in fields—concrete road construction, etc.—where no iron competition was possible. So we are perhaps justified in feeling that in the course of another decade the world will annually put to fresh use just as much cement as it does iron. Personally I think we can safely go further than this, and so will hazard three suggestions as to the future:

1. After a relatively short period of indecision, world outputs of both iron and cement will again increase, the latter at the faster rate.
2. In both industries the outputs of Europe (for export reasons) and of new countries are likely to increase faster than that of the United States, so that our relative importance will slowly decrease.
3. In both industries the future will probably show unusually high rates of increase in new and special products—ferroalloys, alloy steels, alumina cements, and other iron and cement products yet to be invented.

When we come to compare prices and values in the two great industries we find immediately apparent simplicity and real difficulties. As for the first phase, it is approximately correct to assume that the cement output of the world, during the last three years of boom-top, has sold at an average of something close to $8 a ton. The world's output of pig iron must have averaged close to twice that selling price per ton. And if we use these comparative figures we have a world output of pig iron with a total value of some $1,500,000,000 a year as against an annual world output of cement selling for a little over $500,000,000. So on this simplest possible basis the iron industry produces three times as much value as does the cement industry.

Cement Sold Directly to User

But, unfortunately for the cement industry, the real comparison is still more to its disadvantage. For, while pig iron is now, in most areas and for most grades, merely an intermediate product used chiefly for statistical purposes, the cement is actually sold almost entirely as crude cement and passes from the hands of its producer finally at the low tonnage prices—$8 or so—above estimated. So whenever the two industries are compared in a financial way, we find that the cement industry is selling a low-priced product, selling it in a crude state, and making it at a relatively low rate of turnover as compared with plant investment per ton. Most of the past troubles of the cement industry can be traced to these entirely natural conditions.

Of course, there are three possible and very obvious remedies for those conditions, but unfortunately only one of them has ever been se-

riously attempted in the United States. The three possibilities are (1) raising prices, (2) making special cements and (3) selling the cement in a more finished form. The last, except for the minor fields of cement blocks, pipe, etc., implies entering the contracting field in some lines. It will be noted, of course, that the iron industry has adopted the last two methods in almost all cases; very few companies still make merchant pig iron exclusively, and most steel companies are entirely open to ideas about special steels or more highly finished lines.

Ore Resources Concentrated

For a final comparison we might touch lightly upon a matter in which both bankers and governments are occasionally interested—the matter of control of the industries. Here there is, of course, one sharp natural distinction between the iron and cement industries, arising from the different degree in which their necessary raw materials are concentrated geographically. In the case of iron—though both coal and iron ore is common enough—both the raw materials occur chiefly in closely grouped deposits, so that it is possible to secure not only a necessary supply but a controlling supply, in most cases, for an outlay which is within present banking possibilities. But with regard to cement the case is painfully different. The limestone and clay needed to make Portland cement—or the alternative slag and shale—are all very common indeed, and all except the slag are very broadly distributed over the entire face of the earth. There is hardly a county in the United States or Canada where cement could not be made, if a market were found for the output. This fact implies that no cement trust monopoly or cartel can ever reach absolute safety against new competition. And since each new competitor, coming later into the industry, can if he wishes build a somewhat newer type of mill and make a somewhat better product, the situation is frankly difficult. It has been met in the past in somewhat makeshift ways; it remains to be seen if something better cannot be evolved during the next period of stress. Which, it may be noted, seems to be with us now. The present status of the American cement industry, so far as degree of concentration is concerned, is about that of the American iron industry in 1899, or even less unified. The leading interest, for example, makes perhaps 15 per cent of the total output; it would require consolidation of the five largest cement companies to give the same degree of concentration in cement that was acquired in the iron industry by the Steel Corporation in 1901.

The iron industry, thanks to its relatively concentrated supplies of necessary raw materials, is free from the possibility of having to face a steady series of new and well-based competitors. Its chief troubles are internal, owing to overbuilding in certain areas and countries which have, at one period or other, suffered from over-prosperity and are now facing the necessity for future restriction of market and output.

Downward Price Trend in Prospect

There are a few words that might be said as to the immediate and distant future, because historical summaries are worthless unless they may be of service as guides to future action. In the present case it seems to me that we have very clearly such possible use.

Several years ago it was possible to suggest, in THE IRON AGE notably, that we were nearing the crest of a disastrous business boom all over the world, and that, instead of anticipating new high records in output and still higher prices, the reverse was certain to occur within a few years. Having now reached that point, it should be possible to anticipate the course of affairs during the next decade or so. We have more than ample historic precedent; the difficulty has been that most people overlooked the past.

From any possible viewpoint we must accept the fact that during a long period, perhaps over a decade, the *average* trend of world prices will be downward. The only things that could possibly interrupt that trend would be (1) another and more disastrous World War or (2) another gold discovery like that of the California or Rand fields. Technically considered, neither seems likely to occur within a decade at least. So we may as well accept the generally falling price trend as a necessary feature of that period. It has happened several times before—after the Napoleonic wars, after the American Civil War and the France-Prussian war; it obviously had to follow the even more wasteful World War.

In every case the *immediate* response to falling prices is decreased output of basic commodities. But also in every case output has picked up again in a year or two, regardless of the still-falling price level. We may fairly assume that both immediately decreased outputs and later recoveries (to new levels in some cases) will characterize this cycle also. What must be borne in mind by everyone is that the business recovery, so far as tonnage is concerned, will come about while prices are still relatively low. The iron-master or cement-maker who waits for the old prices to reappear before increasing output or improving plant and process is likely to wait for a decade or more.

New Markets Needed to Stimulate Output

As for the next period of *heavy* increase in output, we may suggest, again judging from ample past history, that it will not arrive until incited by the necessity for supplying new markets—either a new market area (Africa?) or a new type of product, with some special broad advantage over our current grades. The Bessemer steel invention is a case in point. And we may be sure that during the period of low prices there will be similar great inventions and discoveries, in response to this very price-stress itself.

On the purely financial side of industry, the outlook is interesting. For a period of low prices implies clearly a period of very low interest rates, and it is possible enough that the United States is now going into a long period—such as France had experienced before the War—when sound industrial corporations will be able to refund their obligations on a 4 per cent basis or even better. (It will be recalled that practically every steel company in Western Europe had 3 per cent and 3½ per cent bonds selling at par before 1914.) So with lower fixed charges and lower overhead the actual earnings in the case of well-based enterprises are likely to show up surprisingly well in the way of returns on the shares during periods of lowering prices.

And it will be well to keep in mind that a long period of falling prices, *once understood and accepted*, has certain clear advantages. For it is a period when economy, efficiency and intelligence are at premiums, as contrasted with booms, which are favorable only to speculative abilities. It should be unnecessary to recall the facts that both the original Carnegie and Rockefeller organizations were built up during a long period of steadily falling prices.

UNEMPLOYMENT—OUR MOST

By GILBERT L. LACHER

HUNGER in the midst of plenty; bread lines in the shadow of overflowing grain elevators! Cyclical unemployment, the curse of industrial civilization, is again with us.

As in previous periods of severe depression, many suggestions are being made and many formal proposals are being drafted for unemployment relief, but withal our attitude toward the problem has been opportunistic, with our interest in it rising and falling with the exigencies of the business cycle. Notwithstanding the exhaustive studies undertaken as a result of the severe 1921 slump in business, the present depression found this country virtually as unprepared for unemployment as previous downswings in the cycle. Under the illusion of "new era" philosophy during the stock market boom, the possibility of another severe economic reaction seemed remote. On the very eve of the Wall Street crash, leading economists delivered themselves of the opinion, subject only to the usual oracular reservations of their profession, that efforts to achieve economic balance were bringing the business cycle under control.

Industry Puts Its Shoulder to the Wheel

Since that time there has been a sharp reversal of both lay and professional opinion. According to the view of the New York State Committee on Prevention of Unemployment, the "causes of depression and boom are complex, changing and accidental, and have not been any more definitely isolated than have the causes of cancer." Perhaps this turn-about-face is not fully justified and cyclical swings may yet be modified through the perfection of international financial machinery, through an evener distribution of the world supply of monetary gold or through other means, but at the present stage the effectiveness of such measures remains speculative and the stark reality of millions out of work demands action. Employers, no less than employees, are now interested in direct, practical measures of dealing with the problem rather than with roundabout preventives of undemonstrated value. They are determined that they will not enter another depression without positive, definite protection against the devastating effects of enforced industrial idleness. It is realized as never before that in a cyclical downswing unemployment begets unemployment and that deflation of consumer buying power is cumulative.

Industry's concern over the plight of the unavoidably idle has never been so keen, so genuine, so productive of tangible, albeit necessarily temporary, results. The great majority of employers have maintained wage rates, although they have been unable to maintain earnings. By rotating jobs and transferring men to maintenance and improvement work they have kept a maximum number of employees on the payroll. They have contributed to general unemployment funds and in some cases have given direct aid to their own unemployed workers by extending credit for commissariat purchases or by lending money at a low rate or without any interest whatsoever.

Obviously these measures are palliatives and not cures. They serve their purpose in helping tide the country over the present emergency, but do not provide a basis for permanent relief. In the search for lasting remedies many of the proposals offered in previous depressions have been again brought forward, among them a nation-wide system of public employment exchanges, long-range planning of public works and company unemployment insurance. Even the long despised English dole is now commanding serious consideration, as are the State unemployment insurance schemes in vogue on the Continent.

Nation-wide Public Employment Service Urged

While public employment exchanges are not offered as a cure for cyclical unemployment, they can accomplish much by increasing the mobility of labor. As has been well said by Arthur H. Young, chief executive, Industrial Relations Counselors, New York, "the wait between jobs means a loss of morale, loss of savings and decreased buying power. In the huge wildernesses of New York or other great cities, with the bewildering multiplication of occupations and specialization of employment, a deliberate organization of means of communication between employers and employed as is indispensable, if time is not to be wasted in endless runnings to and fro, as the central sorting room of the post office or the telephone exchange. Not only do private exchanges foster the grossest sort of injustices but they cannot possibly cover the market, they demand fees of those who are not able to pay them and at best are only useful when we have nothing better."

The chief danger to this proposal, as well as to others now under consideration, is that the pressure of circumstances will lead to hasty action. To obtain a background of experience for the organization of a national system of public employment offices, Frances Perkins, New York industrial commissioner, created the State Advisory Council on Em-

CHALLENGING SOCIAL PROBLEM

INDUSTRY is determined that it will not enter another depression without protection against the devastating effects of unemployment.

A national employment service, although not recommended as a cure for cyclical idleness, would increase the mobility of labor and prevent much unnecessary distress.

Public works relieved unemployment following the war in Great Britain and Germany, but the point has been reached in both countries where further resort to this expedient would mean an outright waste of resources.

Private unemployment benefit plans in this country cover a very small percentage of our wage earners.

The chief drawback of company plans is that they do not apply to all employees, leaving new or temporary workers unprotected.

State unemployment insurance bills proposed in this country place the entire burden of cost on the employer, in contrast with existing European schemes, which divide the cost among Government, employers and employees.



ployment Problems, which has sponsored the setting up of a model exchange at Rochester, N. Y. A fund of $75,000, the major part of which has been subscribed by philanthropic organizations and other private sources and the minority of which will come from the locality itself, has been subscribed to finance the exchange for three to five years. In this way talent unavailable under the restrictions of civil service brackets may be obtained and the operation of the exchange can be kept free from the influence of partisan politics. The bureau will concentrate on developing correlating functions in conjunction with existing private and State exchanges, since a national system of employment offices will prove effective only if it succeeds in coordinating the work of the individual units, thereby promoting a free flow of labor.

Previous Experience

Meanwhile the Wagner bill, now before Congress, may be passed. Under its provisions, the Federal and State governments will equally divide the cost of setting up and operating State exchanges. The States, in turn, can divide their share of the cost with localities desiring employment offices. This undertaking, if authorized by statute, would not represent the first effort to create a nation-wide labor market. A national employment service was hastily set up during the war through Federal grants which made possible the extension of existing State offices and the establishment of hundreds of new bureaus. In October, 1918, there were 832 exchanges covering every State, on a total appropriation of more than $5,500,000 from Federal, State and municipal sources. The service, however, was accused of partisanship and failed to win the confidence of business men. Congress starved it by reducing appropriations and by 1928 there were only 170 surviving offices and these had relapsed into a decentralized condition.

Long-Range Public Works Program Has Limitations

Long-range planning of public works has much to commend it as a measure for relieving cyclical unemployment, although it has not yet been given a trial in this country. Such a program, however, has its limitations. For its successful operation it requires that money



be appropriated and set aside, that blue prints be kept ready, materials be estimated and number of workers determined far in advance. Actual public needs may change in the interim and public moneys, under the stress of relief requirements, may be expended wastefully. Morever, the amount of public work that can be done without going to the extreme of providing work for work's sake alone has definite limits. Both Great Britain and Germany relieved unemployment after the war by filling accumulated shortages in houses, public buildings and transportation, but the point has now been reached in both countries where it is doubtful whether such work can be continued without outright waste of resources.

Unemployment Benefit Plans

Experience with unemployment benefit plans in this country has been limited. In 1928 slightly more than 107,000, or less than one-half of one per cent of our 23,000,000 wage earners, had protection against unemployment. Payments in unemployment compensation in that year totaled close to $1,500,000. The basic difficulty besetting these plans is to procure sufficient funds for compensation and to keep them solvent in times of depression.

In most of the plans set up, the Industrial Relations Counselors find, financial provisions for unemployment benefits have been somewhat haphazard and have received less attention among both unions and employers than other activities engaging their attention. Few, if any, of the plans are on a sound actuarial basis and thus necessarily are operated on the method of trial and error. Among the unions, when funds become inadequate, assessments are levied or the plan may be abandoned.

Trade unions, according to the Industrial Relations Counselors, are more severely handicapped in supporting unemployment benefit plans unassisted than are the employer-union joint groups or employers operating such plans on their own responsibility without contributions from the workers. While employers may restrict the number of layoffs by shifting workers from one type of job to another within their establishments and also are in a better position to accumulate reserve funds in good years, the union must either find new jobs for its unemployed members or pay benefits. Cyclical depression, however, generally affects all firms using the same type of labor at the same time. Thus the unions are likely to face the maximum pressure on their financial resources when a minimum of their memberships is employed.

Company Plans Restrict Eligibility

Company plans pay higher benefit rates at a lower cost than either trade union or employer-employee joint agreement plans, according to the Industrial Relations Counselors. Twelve management-operated plans are known to be in existence in this country, all but one financed by the company alone. The exception is the recently inaugurated program of the General Electric Co., which calls for contributions from both the workers and the management. The Procter & Gamble Co. guarantees eligible employees full pay for 48 weeks of the year and half pay during the remaining four weeks. Such a guarantee is particularly desirable because of its constructive effect. It stimulates management to provide steady work, it eliminates fear among employees and by sustaining their buying power helps keep down general unemployment.

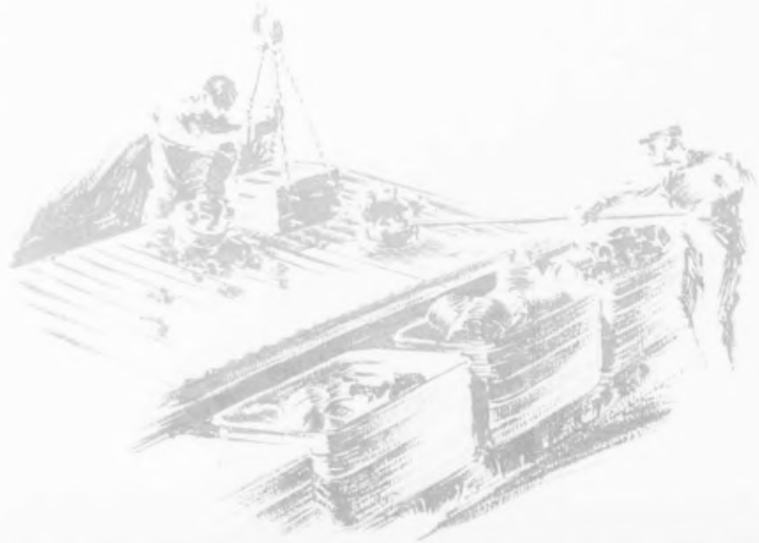
But continuous operations are limited mainly to manufacturers of staple products that can be stored during dull seasons and to those making a group of products with complementary seasons. Where storage costs are high or products are subject to rapid changes in style, regularization of plant schedules seems less practicable.

One of the main drawbacks of most of the company plans is that unemployment benefits are not payable to all workers. Usually they are limited to employees who have been in the service of the company for periods ranging from one month to five years. In 1928 only 8500 out of the 10,920 people covered by the existing 11 company plans were eligible to benefits. These restrictions provide security for a steady working force, but leave the temporary employees unprotected.

Is Public Unemployment Insurance Inevitable?

Management in general must bend itself to the task of protecting employees from irregular employment or the State will take the matter in its own hands, in the opinion of the New York Committee for the Prevention of Unemployment. It adds that some form of voluntary unemployment insurance might be devised and paid for by employers and workers analogous to group health and life insurance. Other students state, however, that such insurance cannot be written by private companies, because there is no actuarial basis upon which the incidence of unemployment can be computed. Public unemployment insurance schemes have been opposed, because of our reluctance to add to already extensive bureaucracies.

Both the English and the European insurance plans levy contributions from the Government, the workers and the employers. The British scheme was adopted in 1911 and first applied only to the heavy engineering industries and similar trades. It is reported to



have operated well until after the war, when, as an emergency measure to take care of the greatly expanded number of unemployed, it was modified to have more general application. In the absence of any real revival of industrial activity in Great Britain in the years since the armistice, many workmen have enjoyed benefits without ever making any insurance payments. From Jan. 1, 1919, to Sept. 30, 1930, £458,245,000 was expended in unemployment benefits. The benefit fund has been exhausted and continued payments have been made possible only by borrowing from the Exchequer. On Dec. 1, 1930, the debt to the Exchequer amounted to nearly £56,000,000.

Bad Features of the European Plans

One of the bad features of the plan is that those receiving the dole have no incentive to accept part-time work because that would invalidate their benefits. The amount of the benefit is 17s. a week, or double the original benefit. Virtually all out of employment in Great Britain now receive doles. The number of registered unemployed is 2,500,000, or 20 per cent of the insured group. Despite the heavy tax burdens the plan has imposed and the encouragement it offers to indolence, it is probable that Great Britain is better off than it would have been with outright pauperism, unrelieved except by charity.

In Germany the unemployed exhaust their rights to insurance benefits after 32 to 45 weeks of such relief, and then become charges on the municipalities. Nevertheless the insurance fund is in danger of being wiped out, because the number receiving maximum benefits has doubled within the past year. The registered unemployed totaled 2,690,000 in May, 1930, and by the end of December had risen to 4,000,000.

Unemployment Insurance Legislation Proposed

No dependable statistics are available on unemployment in the United States. The census count, in April, 1930, showed 2,500,000 out of work, but these figures did not include laid-off or part-time employees. Conservative estimates are that the total number of unemployed has passed 4,000,000 and will reach 5,000,000 before the winter is over. One of the advantages claimed for the proposed national employment service is that it would provide the machinery for



keeping a continuing record of the total number of unemployed.

Such a service would also be essential as an agency for registering the unemployed if any system of state unemployment insurance should be adopted. Unemployment insurance bills that have been proposed in this country place the entire burden of cost on the employer. This is the case with a bill that has been drafted by the American Association for Labor Legislation.

This provision does not appeal to employers as fair and contrasts sharply with the European plan of dividing the cost among Government, employers and employees.

American industrial opinion is still generally opposed to state insurance if private means of protecting workers against unemployment can be found. American manufacturers also believe that more experience with voluntary plans is needed before a sound governmental scheme can be devised. If in the end, state insurance should prove inevitable, they believe that a distinction should be made between seasonal and cyclical unemployment. Industry may be properly called upon, under private or state plans, to assume major responsibility for relieving seasonal unemployment, but when idleness becomes chronic, as in a depression, the burden should pass to the community at large. Under such an arrangement, benefits from the insurance fund would be paid for say 6 or 13 weeks of idleness, whereupon payments would be made directly by the state or from a special fund created to meet cyclical conditions.

Hasty Measures Opposed

Industry is, in no sense, disposed to shirk its responsibility. It realizes fully the essential solidarity of its interests and those of its employees. Its policy during the existing depression has been consistently solicitous of the welfare of its working forces. It is significant that industrial relations departments, which showed a high mortality during the 1921 slump, have not only survived in the present period but have proved most useful instruments of working out practical measures for forestalling and relieving distress.

Industry recognizes that the current depression has made unemployment the most challenging social problem on the horizon, a problem that must be studied carefully from all angles, a problem for which no hasty solution can safely be devised.

What Are the Facts on the Hawley-Smoot Tariff

(*Continued from page* 70)

tional competition since it authorizes the commission to take account of all vital elements entering into actual determination of the conditions of competition between foreign and domestic producers.

President Hoover has declared his intention to make the provision an effective means of removing any serious inequities or inadequacies that may be incorporated in the new law and has invited other nations to avail themselves of the powers of the commission to pass upon their complaints against alleged tariff obstacles.

Commission May Recommend Rate Changes

Unlike the former provision the present one authorizes the commission to recommend changes in rates which may be increased or decreased by not more than 50 per cent.

If the President approves the new rate goes into effect upon proclamation. Changes, however, do not become effective until 30 days after the proclamation, thus allowing shipments en route to be cleared and pending transactions to be completed under the old duties.

Immediately upon passage of the new tariff act, members of the Senate introduced some 35 resolutions calling for investigations under the flexible provision. Hearings have already been held on a dozen or so. Among them was a hearing on pig iron, when merchant producers along the Atlantic seaboard asked for a 50 per cent increase in the present duty of $1.12½ a ton. Another hearing related to woven wire fencing, domestic producers also seeking an increase in the new rate.

EXECUTIVE POLICIES FOR 1931

By JOHN H. VAN DEVENTER
Industrial Consultant—The Iron Age

FOR the past year or more, American business has been executing a strategic retreat. No other maneuver was possible in the face of an overwhelming horde of frozen consumer-pocketbooks, suddenly congealed by the stock market crash. One cannot successfully assault such an ice-barrier; it must be given time to thaw.

On the whole, the retreat of business and industry has been an orderly one. There has been no helter-skelter stampede of wage and price cutting such as have characterized other depressions. Prices have come down, it is true, as part of the process of thawing out the frozen pocketbooks, but in many cases this has been compensated for by the efficiency gains in production which have followed the most rigorous self-examination that industry has experienced in many years. The executive question mark has been put intensively to work in our industrial plants and factories, with the result that hitherto unseen wastes have been eliminated and overhead costs materially reduced. Industry as a whole, in spite of its reduced volumes, is on a higher efficiency plane than it has ever been before. Probably this is particularly true in the metal-working industry.

The strategic retreat was inevitable, under the existing circumstances, but it has continued long enough. Our normal measure of prosperity cannot be won back until the about face is executed and the forward march begins.

How Much Buying Power Have We Lost?

When business and industry are forced to retreat, the casualty lists of unemployment lengthen. Men out of work have a minimum of consuming power, and those still employed, whose hours have been shortened, suffer a decrease in total earnings, though their wage rates may remain undiminished. How much have unemployment and curtailed operations cost us in buying power?

We have no means of knowing exactly how many men and women are out of work, but an average of private and official estimates puts the total at three and one-half million. During normal "good times" we have an average of approximately one million. We can estimate that two and one-half million represents the increase in unemployed ascribable to this depression. With due respect to the unfortunate exceptions, one may say with truth that the bulk of this increase in the ranks of the idle comes from the lower strata of capability and skill. The more desirable are retained because they are harder to replace.

The average normal earning power of those totally out of work probably did not exceed $25 per week, many of them being casual and seasonal workers. Civic and private philanthropic movements are well under way which will provide a large number of these unemployed with at least a nominal earning power. But assuming that their state of unemployment has extended a full ten months, the loss in wages of the two and a half millions amounts to $2,800,000,000 in round numbers. A large figure, but not in comparison with the 90 billion dollars which represent our



normal annual total of 1929 buying and selling.

It is more difficult to approximate the loss of buying power which has been due to curtailed industrial operations. The depression of 1920-1921 was characterized by severe unemployment, extending over a period of more than 16 months of curtailed productivity. Yet the average shrinkage in volume of productivity for the 16 months following the break in September, 1920, as recorded for 64 various manufactured products, was but 23 per cent under the record of the eight booming months of activity which preceded the break. When the records are available, in the case of our present depression, we shall probably find that manufacturing volumes, over the depression period, have not averaged more than 25 per cent below the average for 1929. On this basis, assuming the total wages paid to have shrunk in like proportion, industry's short time operations, during the past year, will have cost us an additional 2.6 billion. Some of this has already been accounted for under the loss of wages of the totally unemployed, but we will let it stand for good measure.

Assuming that the misfortunes of the American farmer have cost him from a quarter to a third of his total crop values, we find an additional shrinkage of 3 billion dollars. Thus far, our total of diminished buying power amounts to $8,400,000,000. We cannot increase this on the account of diminished dividends, since the total dividends paid by American corporations during the first eleven months of 1930 exceeded those paid in 1929 by a quarter of a billion dollars. We must, however, take account of the decreased earnings of corporations and private firms and the lessened income and profits of the professions and of retail business. Four billion dollars is an outside figure for this loss, and our final total becomes $12,400,000,000.

This estimate of a decrease of American buying power averaging approximately one billion dollars per month, as compared with the 1929 average, coincides with the figure arrived at by the *Annalist* and with a number of other estimates. It may be accepted as fairly representing the actual facts.

So our normal purchasing power of 90 billion dollars, representing American buying and selling in 1929, has shrunk to slightly less than 78 billion today, or a decrease of close to 14 per cent.

But while the total number of our total dollars has been shrinking, the individual dollar has been getting bigger. The dollar of today, due to price declines, will soon

SUGGESTIVE EXECUTIVE QUESTIONNAIRE

1—Have we put the question mark to our selling methods in the same intensive way that we have applied it to operating methods?

* * *

2—Are we entering the sales battle of 1931 armed with effective ammunition regarding the recent product improvements?

* * *

3—Are we setting aside in our budgets a sufficiently increased amount for sales effort to meet the higher buying resistance?

* * *

4—Have we increased our advertising efforts and made them more calculated to appeal to the frozen pocketbooks?

* * *

5—Are we unconsciously letting the clouds of pessimism obscure the sunlight of sales opportunity? Are our salesmen "depression minded"?

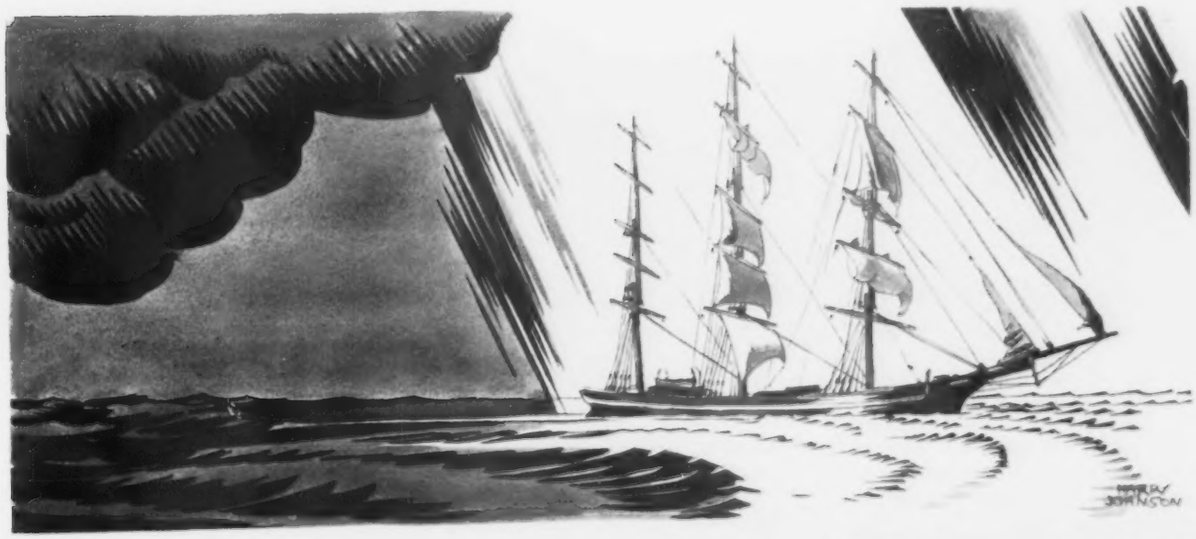
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6—Are our products on a legitimate price level for 1931? If so, what are we doing to prove this point to the gentlemen from Missouri?

* * *

7—Is our sales presentation, in general, the same as it was two years ago? Do not we need a rather complete revision of it to meet altered conditions?

▼ ▼ ▼



do, if it does not already do, 15 cents more business than the dollar of a year ago. In other words, our depleted stake of 78 billions is capable of maintaining a larger volume of business now than our 90 billions did a year ago. Actually, despite our setbacks, we have more buying power than we have ever had, due to the increase in buying power of the dollar. America has the wherewithal at this very moment to maintain a volume of business and a rate of employment equal to 1929, at the present price levels.

1930 WILL undoubtedly be characterized in history as a year of general retrenchment. The keynote of executive policy in the industrial world was adjustment to decreased production volumes. This entailed an intensive and thorough questioning of methods and machinery as well as of men. Excess costs and industrial wastes have been pruned in wholesale fashion, with the result that, except for unemployment, industry has weathered the storm in excellent shape, and has attained a new efficiency level.

The retreat of industry and business, in view of confronting conditions, was unavoidable. It has been an orderly one. But it has gone far enough. The contention of the accompanying article is that the loss of American income, during the past year, has now been offset in large part, if not wholly, by price declines, so that our present total purchasing power is about sufficient to maintain production at normal levels. And volumes must be brought back to normal if we are to solve the unemployment problem.

Industry's problem for 1931 is the restoration of normal production and consumption volumes. The keynote of executive policy will be the stepping up of sales effort to overcome abnormal buying resistance. More effective selling is the first step toward better volumes, better prices, better profits and the reabsorption of the unemployed.

What, Then, Are We Waiting For?

If America has the buying power necessary to put us back on a level of normal operations, what, then, are we waiting for? In answering this question, we must distinguish between power to buy and will to buy. It is the frozen pocketbook that is holding us back. Most of our authorities agree that the state of mind is much more responsible for present conditions than is the state of money.

The responsibility for revivifying the American will to buy does not rest upon the consumer. He is a buyer, not a seller. We cannot win prosperity back by passing the hat to the public with an appeal to "buy more."

The obligation of thawing out the frozen pocketbooks and thus bringing the upturn rests squarely upon the shoulders of organized business and industry. It is *not* a buying job, it is a *selling* job.

The keynote of successful policy for 1931, in the metal-working industry, as in all other industry, will be found in more intensive and aggressive selling. Sales pressure must be raised, intelligently, to meet the increased buying resistance.

Selling must not be thought of as being confined to the sales department of your business. It goes all the way back to the research laboratory and drawing board. Product improvement, properly capitalized through effective advertising and backed by intelligent selling has been a welcome life preserver to many concerns during the past year, and it will form the background of successful approach to many prospective customers during 1931.

The executive question mark has done a great deal for industry during the past year in raising the efficiency of operation. It has been applied to many methods which have gone unquestioned during prosperous times, with the result that better methods have been found and applied. The question mark is just as effective a stimulator of sales procedure as it is of shop practice. Now is the time, if you have not already done so, to apply it to your sales methods and arguments. For 1931 will require the uplift of tireless and intelligent sales effort to push volumes back to normal and solve in the only sane and sound way the problem of unemployment.

Steel Mill Electrification

(*Continued from page 39*)

What is believed to be the first application of synchronous motors to flying shear drive is in connection with the 20-in. hot strip mill in the Great Lakes Steel Corpn.'s plant. The shear is of the Mesta rotary flying type, and, to insure that the metal shall be cut into equal lengths, it is necessary that the speed of shear be synchronized with the delivery speed of the metal from the mill. As the metal may be delivered from any one of the last three stands, it must be possible to synchronize the shear with either of these stands. To accomplish this, on the drive for each of these three stands an a.c. generator is provided, and the shear is driven by a synchronous motor, the power for which may be obtained from any one of the three a.c. generators. In order to provide means for adjusting the length of metal cut, a Waterbury hydraulic adjustable speed gear is interposed between the synchronous motor and the shear itself.

In the modern continuous wide strip mills "loopers" are placed between the finishing stands to throw loops in the metal and prevent any tendency to buckle. These "loopers" are usually small-diameter rollers mounted on lever arms in such a way that they may be raised up against the underside of the moving strip. It has in the past been customary to operate these looping devices by either hydraulic power or compressed air. In two recent strip mill installations, that of the Wheeling Steel Corpn. at Steubenville and the Great Lakes Steel Corpn. 20-in. strip mill, these loopers are actuated by d.c. motors of the General Electric MD-400 type acting as torque motors. As the finishing stands of these mills are driven by individual d.c. motors, it is possible to control the looping motors by relays which are responsive to the loads on the main driving motor.



Photograph by John P. Mudd for the Midvale Co.

Reproduction of a print of a yard locomotive at dusk that was hung at the Los Angeles All American Salon of 1930.

VALUE RATHER THAN VOLUME IS KEY TO PROFITS

By W. W. HAY

SUCCESSFUL manufacturers have an objective toward which all the talents and energies of the entire organization are directed. This objective may be profits, technical perfection, market domination or merely personal satisfaction. But the fundamental objective of all corporations is profits, for that is the reason for which they were financed by the public. The product, the manufacturing plant, finance and other means are but tools in the hands of management, the use of which is directed toward the securing of profits for the public partners—the stockholders.

During periods of low demand like the present, we are confronted with the failure of many corporations to secure the desired regular profits. And the occasional exception raises the question, "How do they get that way?" What is behind the remarkable business achievement of Ford Motor Co.? Or why can one out of many makers of washing machines secure a large volume of sales and report greater profits than ever before? The answer is to be found in price policies—not absolute dollar-sign price tags, but relative value measured by dollars and sense.

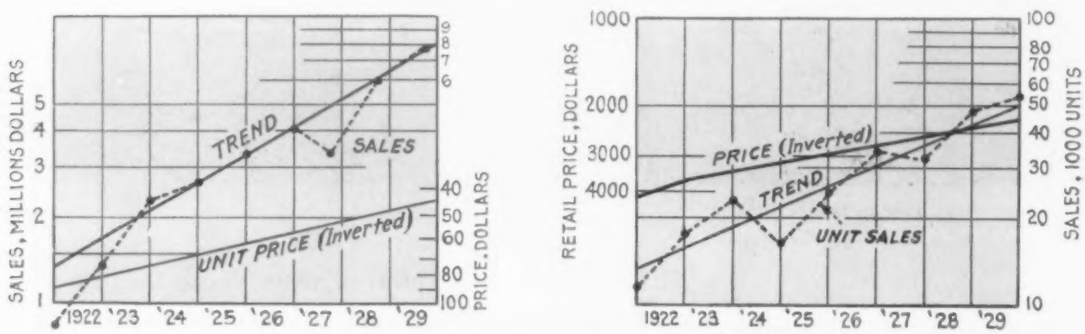
Price is an economic factor leading to demand. When the elasticity of demand is small, as it now is for most manufactured articles, the responsiveness of the public to a lower price is measured by the value relative to other or similar articles. The idea of value is cumulative in that it takes many years of advertising an article of merit before the public has an appraisal of its relative worth.

Prices vs. Price Policies

Manufacturers who have well defined and established price policies are usually successful. They first of all differentiate between prices and price policies. How effective long-continued price policies may become is well illustrated by the accomplishments of two widely differing corporations—a maker of small electric tools which retail for less than $100, and a manufacturer of fine passenger automobiles that retail for several thousand dollars.

Since the World War, sales of the former company have been progressively increased at a rate of about 20 per cent annually as a result of constantly added value and consistently decreased prices for its main line of electric hand drills. This policy enabled it first to adopt quantity production during the prosperous years 1921 to 1924, since when by continuously increasing efficiency in manufacturing methods it has been able further to perfect the product and lower the price one-half. Meanwhile earnings increased steadily, but profits were used, not to increase capacity or to build markets for new products, but to acquire known products having a similar market. All products are sold through the same channels; they are diversified over a number of industries, repair parts service is prompt, and the good will so achieved has given the products an added value.

The motor car maker early built up a reputation for fine automobiles and remains one of the only survivors among manufacturers of passenger cars who continue to build fine cars and make a profit doing so. This company has been able to grow steadily because of well-defined price policies adopted



The graphs show the relatively steady upward trend of sales of a small electric toolmaker (at left) and an automobile manufacturer (at right) in relation to a consistent price policy.

when the passenger automobile was passing from being an article of luxury to its present status of a necessity. At this time there were so many technical advances made simultaneously that the demand for many makers outran production facilities for a time and, during 1923, the average wholesale price of closed passenger automobiles reached the lowest level of the open car. During such rapid expansion of an industry, the ultimate success of producers depends a great deal upon the distribution of the large profits.

Success Depends on Distribution of Profits

A great many corporations making passenger cars made the mistake of devoting too large a portion of their profits of this period to making additions to capacity, and too large a portion was returned to the public in the form of lower prices. At this time the motor car maker in question embarked upon its successful policy of returning a part of its profits to the public through lowered prices, a part in added value, retaining a part in the business as working capital, devoting a part to making improvements to plant and methods, and paying a part to the stockholders as dividends. Plant and equipment betterments enabled the company to lower costs still more and to improve its car by further refinements, so that when demand slackened, it was able to reduce prices on a finer car and again expand sales—at a profit. After several years of this policy, this manufacturer was the only survivor of prewar makers of luxury cars to pay regular dividends on its capital stock. While reducing retail prices 40 per cent in seven years, it increased unit sales over 300 per cent and was able to increase profits at the rate of 16 per cent annually.

Another illustration of management policies that have borne fruit even in these days of low demand is noted in the case of a maker of household washing machines. This corporation now has the enviable distinction of having doubled its net earnings since 1922, while gross sales volume increased less than one-half. And its sales and profits are reported as being greater this year than at any previous time. We consider the household washing machine industry as limited, for its long-time rate of growth has slowed down to a replacement basis, or less than 5 per cent annually. Furthermore, unit sales of this class of consumer articles expand and contract with similar changes in business activity, and most manufacturers in the industry are having a very lean year.

Stress Better Methods, Not Expansion of Capacity

The success of this company rests upon the good management which has reinvested profits to improve factory methods, to diversify markets and to improve models. During 1928 it placed on the market an improved model of particular appeal to the apartment dweller, but was content during the last wave of consumer buying to do business in all models, improving the new model and reducing costs. During the early months of this year it embarked upon a campaign of advertising, featuring the apartment model, and the sales volume from this model has not only made up the losses in standard machines, but now is greater than ever before. The company took advantage of cost savings secured by improving methods and from lower prices of materials to give the buyer a new article at a better price.

The success achieved by these managements was not fortuitous, but rather the outcome of long con-

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MANY volume producers make the mistake of flooding their potential markets by cutting the price level down to a point where competition is based solely on price.

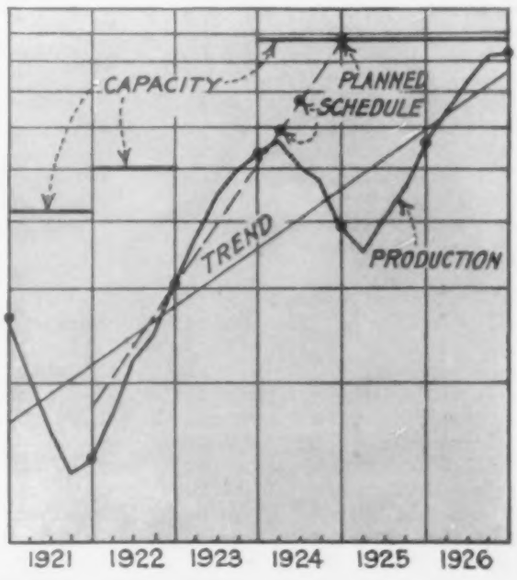
Dependent on quantity to lower costs they cut prices during periods of greatest output and, when demand tightens, are often unable to make further price reductions.

Companies that expand capacity in step with cyclical business expansion suffer a particularly heavy burden when demand falls off.

A conservative policy of returning a part of profits to the public through lowered prices and added value, retaining a part in the business as working capital, devoting a part to making improvements in plant and methods and paying a part to stockholders as dividends has proved the best guarantee of sustained earnings.

Such a program permits the reduction of prices when business slackens, bringing out the deferred demand that always accumulates in the case of products sold on the basis of value rather than price.

A VOLUME producer of automobiles made the mistake of increasing capacity and planning its production schedule on the basis of cyclical expansion in business. How widely actual production deviated from expected output is shown. (Production is plotted as four-quarter totals on end to reflect cyclical changes).



RUSTLESS STEEL'S OUTLOOK

CONSUMPTION of stainless steel showed expansion in 1930, and widening uses make prospects notably promising. Adoption by the food industries for handling and packing is proceeding at a pace faster than in the automobile trade, which uses about half of the total. Numerous applications are being found in the building field, for trim and furnishings, in marine work and in the chemical industries. Popularity rests on corrosion resistance in some cases and on attractiveness in others.

RUSTLESS steel made considerable advance in tonnage consumed and in increase in uses in 1930 in spite of the business depression, and manufacturers are confident that considerable further progress will be made this year in broadening the market for this steel. They base this expectation on the large amount of interest that is being shown in stainless steel by companies and industries that are now using the 18 and 8 chrome-nickel material. A number of new uses was found for stainless steel during the year and it will be adopted for the first time this year in making various other products.

The product is now used in considerable quantities by three important industries — the automotive, the food and the oil industries. The largest amount is used at present by the automotive industry. About equal amounts are being consumed by the food and oil industries. While the use of stainless steel by the automotive industry increased considerably during the year, the greatest gain was in the food industry, and it is predicted that the greatest growth in the demand this year will come from the latter industry. In fact, some expect that this eventually will be the largest field for the stainless material. The food industry is a very broad field, covering the packing, canning and preservation of food products, the dairy and cheese-making industry and refrigeration for the preservation of foods.

The increased demand for stainless steel during 1930 resulted largely from its adoption in comparatively small quantities by a large number of users rather than by its substitution for other materials consumed in large quantities. Consequently the number of orders multiplied. The larger demand for the stainless material is in its sheet form. Considerable tonnage goes into tubing and strip steel.

While the bulk of the stainless material is of the 18 and 8 grade, some plain chromium stainless steel is made, usually in strip form, for use in making less intricate shapes or parts that call for only a limited amount of drawing and consequently do not require a material having as much ductility as the 18 and 8 steel.

Rustless Steel Automobile Parts

In the automotive industry stainless steel won an important place as a material for the manufacture of the smaller bright parts. It is stated that at present every motor car now has some stainless steel parts. For radiator shells the Ford Motor Co. is the only automobile manufacturer that up to the present has used the stainless steel, although some other manufacturers are now experimenting with its use as a metal to replace chromium-plated shells. Shortly before stainless steel came into the picture as a material for bright parts for automobiles, several of the motor car manufacturers installed at a large expense equipment for continuous automatic chromium plating of radiator shells and the substitution of stainless steel for these shells would necessitate the scrapping of this equipment. This is ascribed as one reason for the resistance that some of the automobile manufacturers have shown up to the present time to the substitution of stainless steel for chrome-plated radiator shells.

Automobile parts that are now being made of stainless steel include hood hinges, cowl brackets, running board moldings, windshield and sector moldings and pump bolts. To a less extent it is being used for hub, radiator and gas tank caps and for lamps.

Used in Handling and Packing Fruits and Milk

Recent new uses of stainless steel by the canning industry include containers and other equipment for the handling of juices of citrus fruits. It is being used in the Hawaiian Islands in the pineapple canning industry for tanks and tables and it is even used for the construction of a conveyor provided for the handling of the fruit and juices. Because of its acid-resisting qualities the steel is found well adapted for use for canners of various other fruits.

The packing industry is using nickel-chrome steel for steam-jacketed kettles for boiling hams, casing table tops and for other equipment in which material that will resist corrosion from salt is desirable.

In the dairy industry there has been a rapid increase in the use of stainless steel. It is being used for pasteurizing and milk-holding vats and for the inside of cream separators. One company recently has been formed to manufacture stainless steel milk cans. It is stated that with cans made of the chrome-nickel steel the milk can be pasteurized in the cans instead of being poured into pasteurizers. An-

ONE OF CONTINUING PROMISE

other new use in the milk industry is for tanks for milk tank wagons, replacing the present glass-lined tanks. It is also starting to replace other glass-lined metal receptacles that are used in the food and other industries. It is now largely used by makers of ice cream manufacturing machines.

Further Uses for Building Trim Expected

An expansion of the use of stainless steel in the building field is expected during the current year. The Chrysler and Empire State buildings in New York are the two spectacular examples of the use of this material for outside covering for skyscrapers. The opinion has been expressed that because architects are always on the lookout for novelties and because stainless steel on the outside of buildings is no longer a novelty to New York, it is not probable that this material will be used again for covering large buildings in that city, although some buildings may be erected with stainless steel outsides in other cities where the material is still somewhat of a novelty.

However, a leading builder of large skyscrapers makes a forceful argument in favor of using stainless steel panels for covering the exterior of large office buildings, maintaining that with this type of material a lighter steel frame can be used for a building and the time of erection can be shortened considerably, which is an important factor when millions of dollars are tied up in a building under construction. Church steeples of chrome-nickel steel is another use that has been suggested for the stainless material.

For elevator door fronts and for elevator cabs stainless steel is being used as a substitute for brass and bronze. Very artistic effects are being produced on panels by etching, for which the steel is well adapted. It is also being used for fronts for deposit boxes in bank vaults and for the ceilings and sides of the rooms.

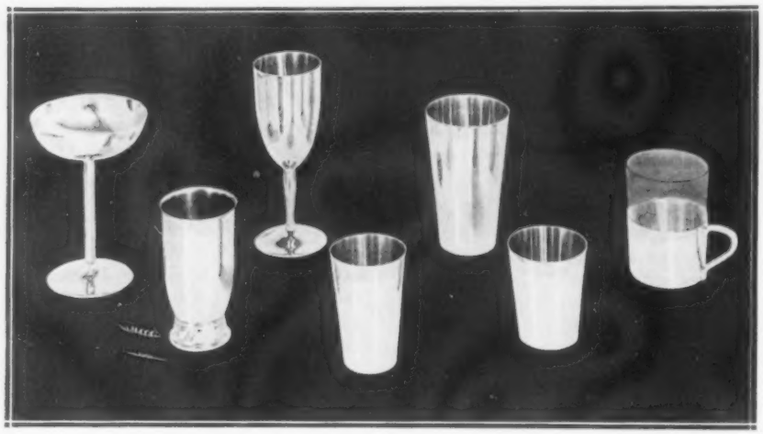
One use that is regarded as very promising is for store fronts and it is believed that considerable progress will be made this year in developing this field. With its glittering luster it is expected that stainless steel will become very



THE major part of the front is of stainless steel, the doors of chromium plated bronze and parts of the base are of bronze. The work was done by the Loeben Ornamental Iron & Bronze Works, Philadelphia.

popular for this purpose, and the material also lends itself to artistic decorative effects. One oil company is considering building gas service stations of stainless steel.

Various new uses for the material and building construction have been or are being developed. These include baseboard moldings, grillwork, domes for indirect lighting, hand rails, cafeteria rails, etched mantel fronts for gas grates, electric push-button plates, kick plates for doors and for lockers in buildings near the seacoast. Bathroom fixtures of stainless steel came out during the year. Casement windows of this steel are a new product that is to be put on the market this year.



Goblets and cups made of Enduro KA2 stainless steel.

For Non-Corrosive Needs in Chemical Industry

The oil and chemical industries are using stainless steel in increasing quantities where non-corrosive and acid and heat-resisting material is required. Considerable of this steel in tubular form is now used in the oil industry in stills and other equipment. A new use is for strainers for pumps in the oil field, these requiring a non-corrosive material. Considerable progress is being made in developing the use of non-corrosive and heat-resisting bolts and nuts and rivets of stainless steel, largely in oil refineries. Leaking of wooden molasses barrels has led a leading chain store proprietor to inquire for stainless steel molasses drums. It is now being used for nitric acid drums.

The stove industry is regarded as a fertile field for stainless steel and in this very little progress has been made except with the electric stove industry. As an oven lining is usually the first part of a gas stove to wear out it is believed that the life of the stove can be prolonged by the use of a stainless sheet steel-lined oven. Oven racks, pans, broilers eventually may also be made of stainless steel. It is now being used for burner cones in oil stoves.

Electric refrigerator manufacturers are now using some stainless steel and this is regarded as a promising field for material for cabinets, trays, linings, trim and hardware. Several manufacturers of soda fountains are now using the stainless material.

Large Use for Hotel and Hospital Equipment

The use of stainless steel for kitchen equipment for hotels, hospitals and other institutions is gaining, such items as drain boards, sinks and table tops meeting with favor. Some of this equipment is also finding its way into domestic use. Considerable of the steel is going into cooking utensils.

The manufacture of tableware of stainless steel heretofore made in Germany is being started in this country and it is expected to become a vigorous competitor of plated ware. Various other articles of kitchenware are being added to the line of stainless steel products.

Opportunities in Marine Field

Two developments recently have been made in the marine field. One is wire for cable and the other is marine hardware. The advantage of stainless steel for these is that it resists the corrosion of salt. Quite a few stainless steel parts have been made for the dirigible that is being built by the Goodyear Zeppelin Co. for the Navy Department. Another use more prosaic is for tacks, the manufacture of which in stainless steel is in an experimental stage.

That it does not require scouring or polishing is one advantage of stainless steel that seems to be aiding in increasing its use. This reduces labor in keeping kitchen utensils and table tops bright and clean in hotels and institutions. This same advantage applies to its use for store fronts, for railings and for various other purposes in building construction.

Some progress was made in 1930 in improving the quality of chrome-nickel steel and in polishing methods and the manufacturers are striving to improve the processes so that after fabricating it can be polished at minimum expense. One recent development that promises to be of importance in broadening the market for this steel is the perfecting of a process for the electrical resistance welding of stainless steel tubing. Manufacture of tubing by this process is expected to be started shortly.

The selling price of stainless steel in sheet form was reduced 2 cents a pound during the year and it is stated that any further reduction will depend on a reduction of polishing costs and an increase in the tonnage produced.

Photo-Electric Tube New Tool of Industry

PHOTO - ELECTRIC control equipment has now been developed to a point where its position in the industrial field is definitely established. It offers a means of solving some of the problems for which no satisfactory equipment has been available heretofore, and also of simplifying some of the processes now in use.

Both alternating-current and direct-current photo-electric relays were applied to many problems in which the interception or application of a beam of light is used to control an electric circuit; *e.g.*, the operation of a magnetic counter, stopping and starting machines, operation of deflector mechanisms on conveyor systems, safety devices, starting or stopping operations on articles that are too small, too light, or too delicate to operate a mechanical limit switch. The ability of these control devices to operate from the interception of a beam of light offers a new tool to industry.

COPPER HAS IMPROVED ITS ECONOMIC POSITION

By EDWARD MOSEHAUER
Vice-president, Metal Sales Corpn., New York

EFFORTS to keep production in close relation to consumption seem assured, following successful negotiations that included African producers. Demand possibilities regarded as promising.

IN the copper industry, though it has not fared so badly as some others, there has also been overproduction. Failure to put into effect early in the year any comprehensive curtailment program was owing to the unwillingness of some producers to recognize the need for such a step and the reluctance of the large producers to carry the entire burden of increased costs of production. Negotiations were delayed also by the wholehearted cooperation of producers with President Hoover's efforts to prevent unemployment.

Voluntary curtailment by North and South American producers was not matched by Canadian and African producers, but negotiations were carried on that ultimately resulted in a plan that seems to insure that current production will not exceed current consumption. This accomplishment is the outstanding development of the year.

Considerable New Refinery Capacity

In the United States the El Paso refinery of the Nichols Copper Co., with a capacity of 8500 tons per month, commenced operations; and at Copper Cliff in Ontario the Ontario Refining Co., Ltd., controlled by the American Metal Co. and International Nickel Co., with a capacity of 10,000 tons per month, began production. Early next year Copper Refineries, Ltd., of Montreal, with a capacity of 6500 tons per month, will be ready to refine the production of Noranda Mines, Ltd. New refinery facilities for such tonnages can only reflect a confident belief in the expansion of the demands for copper.

In 1929 great activity was displayed in America in the absorption by mining companies of fabricating units to assure outlets for their production. In 1930 the Phelps Dodge Corpn. acquired, by an exchange of securities, the National Electric Products Corpn., and that was the only transaction of that nature worthy of note.

Abroad the metal and mining interests have been active. There have been many mergers of German wire and brass mills and part ownership of others has been acquired by English and Belgian interests. A formidable community of interest has thus been established.

The Amalgamated Metal Corpn., which held shares of Gardner & Co. and the British Metal Corpn., effected an exchange of shares with Metallgesellschaft, of Frankfort, Germany, and Societe Generale de Minerais, of Brussels. The Amalgamated corporation, it would appear, hopes to become the medium for providing at some future date supplies for the aforementioned fabricating companies.

When new South African production is under way, the proposed copper refinery at Liverpool will doubtless be ready. A new refinery has been constructed in Wilhelmsburg by the Warburg and Brandeis, Goldschmidt and National Lead Co. group. The Trefileries du Havre is erecting a copper refinery in France, and blister copper for that refinery will be supplied by the Braden Copper Co. under a long term contract.

Realinements of the Flow of Copper

A general appraisal of these activities indicates preparation for partial independence of America in the matter of copper supplies. There need be no fear, however, that South American and some Mexican low-cost producers will fail to retain a market in Europe for their copper, which can be placed abroad at a lower cost than any mines yet developed can meet.

Interest in South African developments is wide-spread and American interests are well represented. The American Metal Co., Ltd., possesses more than a one-fifth interest in the Roan Antelope Copper Mines, Ltd., in Rhodesia. The Bwana M'Kubwa Copper Mines Co., Ltd., and N'Changa Copper Mines, Ltd., have been amalgamated. The Newmont Mining Co. engineers will aid in the development of these properties, while J. P. Morgan & Co. and the American Metal Co., Ltd., also represent the interests of American investors in these properties.

Within the next few years, there will doubtless be a complete readjustment of the entire copper situation and the flow of metal from mines to refineries and consumers radically altered.

Production and Prices

World production for 1930 will amount to 1,760,000 tons, a decrease of 17½ per cent from the production of 1929. The November production was 21 per cent less than the monthly average of 1929. Despite this decrease in production, the stock of refined copper increased 198,512 tons owing to

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MARKET RESEARCH FOR THE MACHINERY INDUSTRY

By E. F. DuBRUL

General Manager, National Machine Tool Builders' Association, Cincinnati

IN the 75th Anniversary Number of THE IRON AGE, A. I. Findley, now editor emeritus, had an article under the title "Industry Will Operate Market Laboratories." The subtitle read "Just as manufacturing is profiting from research, so will distribution get the aid of scientific treatment."

In this article Mr. Findley pointed out that the significant change in business since the war is that research men, engineers and executives of both buyers and sellers are cooperating for the production of materials capable of meeting increasingly severe demand. He predicted that for the next decade all signs indicate that for the first time progress on the distribution problems of industry will be comparable with the advance in production. He well stated that market laboratories have fully as large possibilities of return to producers of goods as laboratories that have been laid down with such lavish outlay for chemists and physicists.

It is a fact that much of the machinery business of the United States is done on pure guesswork. Sales policies are too often based on misty and musty traditions. Some of these traditions were never sound; for instance, the one that a builder of machinery should give up his heart's blood to the few buyers who, during a period of depression, are wise enough to follow Andrew Carnegie's policy of building no plants in times of boom, but to build them during a depression and have them ready for the succeeding boom.

But changes in business conditions have been so great that changes in policies to meet the conditions are now being recognized. It is also recognized that the best way to plan policies is to first find the current facts and to make the policy fit the facts and not try to force the facts to fit an antiquated policy.

What Is Market Research?

SOME executive with an inquisitive mind becomes dissatisfied with mere guessing at market conditions and wants to find true answers to the six important questions of *What*, *Where*, *When*, *How*, *Why* and *Who*.

So he goes out and gets the information that he needs. In other words, he makes a research. It is a good or a bad research depending on how good a research man he is. In any case, any individual company's research is generally somewhat limited because few companies can spend the amount of money or time needed to do the job as it should be done.

If a number of inquisitive executives want the same information, and each one goes out to get it, they multiply expense of time and money. If many of them get to asking the same sorts of questions, the people to whom they go for information get tired of spending their time in repeating answers. So finally some of these inquisitive executives can not get the information in spite of their spending money to do so.

Then some day some one gets the bright idea of saving this waste by doing the job cooperatively. He sees that a joint research will develop much more information and at a smaller cost per company.

Machinery Market Facts

IT is a common rule that if machines are to work well in the beginning of their life, they must be so well made that their wear-out is quite slow. That fact makes for a very small replacement demand as a consequence of wear-out, so it does not take long for a typical machinery market to become saturated.

So if the machinery industries were to depend for their living on replacement of a few worn-out machines, they would have decidedly poor prospects thereafter. After saturating a market with a simple type of machine, necessity for business spurs designers to produce a new and better type of machine which will displace machines that still operate, but produce at a cost that is too high, compared to the cost of producing with the new machine. Of course as the new machine is more productive, it naturally has a smaller market than the old one had.

So to carry on economically the machinery industries should know many market facts; otherwise they may bring out designs that will not repay the cost of development. Therefore they seek facts to guide their judgment in that particular. If research shows the market to be limited, the development cost will have to be gotten out of a few machines, and will have to be covered in the price of those few or the machine industry will lose. If the market is wider, the development costs can be spread over more machines.

So before spending much money on the construction of a machine, it is well to find out such things as how many users there are; what is their present equipment; what is their production; what is its cost. From such facts the machine builder can judge how much of a market there is for the new de-

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MOST builders of machinery can profitably parallel the experiences of the machine tool builder. He proposes to find the causes that seem to work against the recognition of the factor of obsolescence. His researches market-wise are calculated to develop incidentally a wider practice than now obtains of preparing in times of depression for times of high activity.



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sign before he spends money building it.

Improving Selling Methods

TO realize this potential market requires selling, and market research has shown that there is much to be done in improving selling methods.

Research often discloses that sales plans have not been well laid, or that good plans are not well carried out; that good customers are not given proper coverage or that too much selling effort is spent on people who never can be made into good customers. Such wastes in distribution are turned up in every sort of survey. Some very striking examples of these wastes were brought out in the Louisville survey conducted by the U. S. Department of Commerce. The selling effort put in on small stores was shown to exceed the value of the total purchases of the stores.

The selling of machinery is essentially a selling of production efficiency; but apparently few machinery salesmen, selling any kind of machinery, are trained to sell production.

Often buyers and sellers talk about prices per pound of machinery of various sorts. It would be just as logical to compare them on the basis of cubic measurement. Some machines that weigh much less than others are much more productive. But if the pound basis is the proper one for price, the designers of these machines should have loaded their machines with a mass of iron which is entirely unnecessary for the proper functioning of the machine. Salesman training would soon eliminate the weight argument from the selling of machinery.

Market research discloses surprising marketing facts. For instance, a survey of machine tools in service on Jan. 1, 1926, showed that about 44 per cent were over 10 years of age. The age of 10 years was taken as being a fair gage of obsolescence in view of progress in design.

A similar survey made in 1930 disclosed that about 52 per cent of machine tools in service on Jan. 1, 1930, averaged over 10 years of age, in spite of the large amount of machine tools purchased during 1928 and 1929. This progressive ageing is a challenge to the management of the metal working industry. Certainly those users who bought the new designs have no cause to regret their purchases since the new machines have produced more than the machines that they displaced.

If this progressive ageing is to continue to run contrary to the progress of design, the owners of those machines will be crowded out of the business race by those who install the more productive machines.

The machine tool industry recognizes that such facts challenge the efficiency of that industry's marketing staff. And in spite of depression the Machine Tool Builders' Association voted to increase its budget by one third. This increased amount is to be used in market research, to discover

1. Why this retrogression has occurred, and

2. How to correct this condition of mechanical dry rot.

Now since this is the condition of the industries that use machine tools, is it not likely to be true of users of many other kinds of machines? There is no reason to think that the metal working industries suffer more from this dry rot than others. So it appears that the whole group of machinery industries need a searching for facts of this kind.

Four-fifths of Soviet Purchases in U. S. are Machinery

MORE than four-fifths of Soviet purchases in the United States, totaling $149,223,000 during the fiscal year ended Sept. 30, 1930, consisted of industrial and agricultural machinery, according to a statistical analysis published by the Amtorg Trading Corpn. Soviet purchases in the United States in 1929-30 were 38.6 per cent greater than in the preceding 12 months and three times those of five years ago.

During the seven years since the resumption of regular trade transactions, Soviet-American trade turnover has totaled $750,777,000, of which four-fifths was made up of purchases of American products and one-fifth sales of Soviet products in this country.

Agricultural machinery and supplies constituted the largest group of purchases made in 1929-30, the gain recorded during the year in this group being 139 per cent over the preceding year. Since 1926-27 these orders have increased tenfold, the respective figures being $6,618,000 in 1926-27 and $67,442,000 in 1929-30. Tractors made up by far the largest part of this total, being over three times the purchases under this heading in 1928-29, with combines next in order.

"During 1930 the Soviet Union became the leading foreign market for American agricultural machinery and supplies, coming up from the third rank in 1929."



High Lights of 1930

January

PULLMAN, INC., acquires Standard Steel Car Co. and Osgood Bradley Car Co. . . . Ford Motor Co. announces $30,000,000 expansion program for 1930, $20,000,000 of which will go for new plant buildings. . . . Charles R. Hook elected president of American Rolling Mill Co. as George M. Verity becomes board chairman. . . . National Steel Corpn. announces purchase of 1000-acre site in Chicago district for plant to cost $40,000,000 to $50,000,000. . . . Taking of first national distribution census begun at Washington. . . . Production of 5,621,000 motor vehicles during 1929 in United States and Canada sets new high record. . . . Permanent committee of representatives of 67 key industries is organized to further business activity. . . . George Gordon Crawford, former president of Tennessee Coal, Iron & Railroad Co., is elected president of Jones & Laughlin Steel Corpn.; Herbert C. Ryding succeeds him.

February

MOVEMENT toward formation of national federation of machinery industries is started at conference of 19 machinery and equipment associations. . . . Railroad expenditures for next six years estimated at $4,750,000,000 by Washington economist. . . . Newton Steel Co. begins operation of new full-finished sheet mill at Monroe, Mich. . . . American Rolling Mill Co. arranges with John Summers & Sons Co., Ltd., British steel maker, to operate Summers sheet specialty division. . . . William H. Bassett, technical superintendent of American Brass Co., elected president of American Institute of Mining and Metallurgical Engineers . . . . Allegheny Steel Co. announces expenditure of $500,000 on plant improvement in 1930. . . . Warren Foundry & Pipe Co. sells Mount Hope Mineral and Wharton & Northern Railroads to Central Railroad of New Jersey.

March

FOURTEEN types of tool steel embrace 98 per cent of tonnage used, according to metallurgist, urging proper selection. . . . German railroads plan laying of 2175 miles of track on steel ties during year. . . . Continental Steel Cartel proposes establishment of five international sales organizations to direct and control exports and domestic sales. . . . Directors of Bethlehem Steel Corporation and Youngstown Sheet & Tube Co. approve purchase of latter by Bethlehem company despite opposition of Eaton group. . . . Control of Corrigan-McKinney Steel Co., Cleveland, acquired by Cleveland-Cliffs Iron Co., also owner of substantial interest in Otis Steel Co. . . . Eaton and Bethlehem groups begin strenuous efforts to control proxies in fight for control of Youngstown Sheet & Tube Co. . . . Automotive and parts industries took 30 per cent of machine tools made in 1929, according to survey made by THE IRON AGE. . . . Man-hour productivity in steel industry increased 55 per cent from 1914 to 1927, according to Bureau of Labor Statistics.

April

AMERICAN Society of Mechanical Engineers observes fiftieth anniversary of its founding at Washington meeting. . . . Republic Steel Corpn., formed by merger of four companies, begins operation as third largest steel company in country, with ingot capacity of 4,900,000 tons. . . . A. I. Findley relinquishes active duties as editor of THE IRON AGE after 25 years of service to become editor emeritus; W. W. Macon succeeds him. . . . Automatic determination of temperatures of hot steel by means of photoelectric tube is demonstrated by Westinghouse Electric & Mfg. Co. . . . E. T. McCleary, president of the Republic Steel Corpn., dies suddenly at Youngstown. . . . Interests opposed to Bethlehem-Youngstown merger file suit for permanent injunction to prevent its consummation. . . . Complaint that Aluminum Co. of America had violated Clayton and Federal Trade Commission acts is dismissed. . . . Sixty steel producers in Pittsburgh organize to oppose freight rate increase which would place them at $1,000,000 disadvantage.

May

CANADIAN tariff on iron, steel and machinery is revised upward. . . . James A. Farrell pledges maintenance of steel company wages in spite of industrial depression. . . . Charles M. Schwab awarded Gary Memorial Medal by American Iron and Steel Institute. . . Number of workers in steel industry declined 6.6 per cent from 1923 to 1927, according to census of manufactures. . . . American Rolling Mill Co. acquires Sheffield Steel Corpn., Kansas City. . . . Iron and steel freight rates in Official Classification territory placed on mileage basis by decision of Interstate Commerce Commission. . . . Metal Branch of National Hardware Association reorganized as National Association of Sheet Metal Distributers. . . . Warner & Swasey Co., Cleveland, observes fiftieth anniversary of founding.

June

CLEVELAND-CLIFFS IRON CO. and Oglebay, Norton & Co., pioneer Cleveland iron ore firms, are consolidated. . . . Elmer A. Sperry, widely known inventor and past president of American Society of Mechanical Engineers, dies. . . . German steel industry announces 7½ per cent cut in wages, accompanied by 10 per cent price decline. . . . Potential market of more than 8,000,000 tons annually for flat-rolled steel is outlined at association meeting. . . . Merger of Spang, Chalfant & Co., Pittsburgh pipe manufacturers, and National Supply Co., large distributer of oil country goods, is announced. . . . Government brings suit against Steel Corporation seeking surrender of Elgin, Joliet & Eastern Railroad in order to test corporation right to control interstate transportation facilities.

Metal Trades in Review



July

BRITISH survey of Continental steel mills shows wage levels lower, but less disparity between skilled and unskilled labor. . . . Unemployment in Wales is 28 to 30 per cent. . . . Ralph Budd of Great Northern Railway advises Soviet to buy heavy rolling stock and automatic equipment. . . . Survey by Institute of Scrap Iron and Steel shows 1,000,000 tons of scrap produced in 1929 by automobile industry. . . . Safety contest in New York, participated in by 1485 companies, indicates large plants safer than small for the workmen. . . . Bethlehem Steel Co. announces 75 per cent reduction of accidents in all plants in past 16 years. . . . President Eugene G. Grace's 1929 bonus from Bethlehem Steel Corpn. was $1,623,753, according to testimony at suit over Youngstown Sheet & Tube merger. . . . General Electric Co., Schenectady, applies proper tension in wire drawing by use of Thyratron tubes.

August

AMERICAN SHEET & TIN PLATE CO., Pittsburgh, operates 11 mills employing 6216 operatives without single lost-time accident in June. . . . Simonds Saw & Steel Co. announces it will build $1,500,000 windowless factory at Fitchburg, Mass. . . . Construction of first test roadway with foundation of ingot iron sheets begun in Sangamon County, Ill. . . . German unemployed with families represent 11 per cent of total population. . . . 12 engineers from Freyn Engineering Co. leave Chicago for Soviet Union to construct new steel plant at Kuznetsk, Siberia. . . . I. Lamont Hughes elected president, Carnegie Steel Co., Pittsburgh. . . . Republic Steel Corpn. to spend $1,000,000 in expansion program in open-hearth department at Youngstown. . . . Continental Steel Cartel selling offices fail to maintain prices of semi-finished steel and beams, impairing prestige of parent organization.

September

PRICE reductions by automobile manufacturers aid in clearing out unsold stocks of motor cars. . . . Complete city to be built at cost of $25,000,000 to $30,000,000 for 1936 Pacific Northwest Exposition. . . . Steel Founders' Society of America plans to develop new uses and markets for steel castings. . . . Exports and imports register decline for fourth consecutive month. . . . Consolidation of Newton Steel Co. and Corrigan-McKinney Steel Co. considered. . . . J. Leonard Replogle, following study of the British steel industry, advises scrapping and replacing blast furnaces, and the construction of a 3,000,000-ton steel plant. . . . Continental Steel Cartel is prolonged to the end of the year with a 15 per cent reduction in the production quotas of all members.

October

MOTORISTS in United States paid $49 less per car in 1929 than in 1928 and $135.10 less than in 1928. . . . New plant of Ford Motor Co. at Dagenham, England, nears completion. . . . Ford has scrapped more than 30,000 motor cars at Rouge plant. . . . American Society of Mechanical Engineers elects Roy V. Wright, of *Railway Age*, president for ensuing year. . . . Bronze memorial to George Westinghouse is dedicated in Schenley Park, Pittsburgh. . . . Pratt & Whitney Co. celebrates seventieth anniversary. . . . General Electric Co. announces a $1,000,000 transformer manufacturing plant to be built at Pittsfield, Mass., constructed of glass and welded steel. . . . National Machine Tool Builders' Association to study markets for their products. . . . Negotiations begin for cartel reestablishment. . . . Large beryllium deposits, 100 to 800 ft. below the surface, reported found near South Gate, Cal. . . . Republic Steel Corpn. order books for rustless steel from French motor car manufacturer.

November

FORD MOTOR CO.'S production of automobiles for 1930 estimated at 1,500,000, contrasted with 1,950,000 in 1929, and Chevrolet production placed at 800,000 for the year. . . . Scrap dealers discuss disposal of old automobiles at conference in Cleveland; obsolescence this year being estimated at 3,000,000 cars. . . . Survey by Institute of Scrap Iron and Steel shows 30,000,000 tons of scrap used in 1929. . . . Value of manufactures in 1929 given by Bureau of the Census as $68,000,000,000. . . . Railroads serving Western Trunk Line territory file protest with Interstate Commerce Commission on iron and steel rate structure effective last May. . . . Black sheet extras revised downward. . . . National Steel Corpn. votes to acquire Michigan Steel Corpn., Detroit. . . . Indian boycott of British goods damages many British exporters. . . . Canada advances duty on tin plate to protect home industry. . . . Soviet Union to build 1,500,000-ton Ural steel plant under supervision of Arthur G. McKee & Co., Cleveland. . . . Dr. Richard Moldenke, consulting metallurgist, dies Nov. 17. . . . P. N. Guthrie, Jr., is elected president of Reading Iron Co.

December

GENERAL ELECTRIC CO. adapts Thyratron (photo-electric tube) to maintenance of proper tension in wire reeling. . . . American Iron and Steel Institute informed that cold-rolled strip steel capacity of United States is greater than market needs. . . . Ford Motor Co. expected to reduce automobile prices soon, and opens new assembly plant at Edgewater, N. J. . . . Evidence accumulates that Ford will build V-type 8-cylinder motor. . . . Management engineer finds European manufacturers slowly emulating American methods. . . . Otis Steel Co., Cleveland, contracts for continuous sheet mill to be completed Feb. 1, and Inland Steel Co., Chicago, takes out license to operate continuous sheet mill. . . . Bullard Co., Bridgeport, Conn., celebrates fiftieth anniversary. . . . Continental Steel Cartel renewed to June 30, 1931. . . . Expiration of 58 German wage contracts on Jan. 1 will affect 761,000 workers.



SHARP DECLINE OF PIG IRON

Table of Steel Exports and Imports of Leading Countries in Millions of Gross Tons

Exports	1913	1926	1927	1928	1929	1930*
United States	2.89	2.06	1.94	2.35	2.48	1.70
Great Britain	4.97	2.99	4.20	4.26	4.39	3.20
Germany	6.20	4.82	4.23	4.64	5.48	4.45
France	0.58	4.13	5.60	4.99	4.21	3.95
Belgium	1.55	3.71	4.61	4.46	4.52	3.85
Total	16.19	17.71	20.58	20.70	21.08	17.15
Imports	1913	1926	1927	1928	1929	1930*
United States	0.25	1.02	0.69	0.69	0.65	0.50
Great Britain	2.23	3.74	4.41	2.89	2.82	2.80
Germany	0.30	1.03	2.23	2.02	1.44	1.15
France	0.17	0.18	0.13	0.14	0.25	0.45
Belgium	0.87	0.60	0.64	0.87	0.98	0.80
Total	3.82	6.57	8.10	6.61	6.14	5.70
Export excess	12.37	11.14	12.48	14.09	14.94	12.45

*Partly estimated. Luxemburg included in Belgian total.
Scrap not included in these data.

Table of World Production of Pig Iron in Millions of Gross Tons

Country	1913	1926	1927	1928	1929	1930*
United Kingdom	10.26	2.46	7.29	6.61	7.59	6.25
Germany	16.49	9.50	12.90	11.62	13.19	9.50
France	5.12	9.28	9.18	9.82	10.20	10.00
Belgium	2.45	3.35	3.69	3.84	4.03	3.35
Luxemburg	2.51	2.52	2.69	2.73	2.86	2.45
Saar	...	1.61	1.74	1.91	2.07	1.90
Russia	4.55	2.21	2.92	3.22	4.24	4.95
Poland	...	0.32	0.61	0.67	0.69	0.48
Norway	...	0.08	0.08	0.08	0.14	0.12
Sweden	0.72	0.49	0.45	0.43	0.52	0.46
Italy	0.42	0.55	0.53	0.56	0.71	0.52
Austria	2.31	0.33	0.43	0.45	0.45	0.40
Hungary		0.19	0.29	0.30	0.28	0.25
Czechoslovakia		1.07	1.30	1.54	1.62	1.45
Spain	0.42	0.48	0.60	0.56	0.74	0.65
Roumania	...	...	...	...	0.10	0.10
Holland	...	...	...	...	0.25	0.26
United States	30.97	39.37	36.57	38.16	42.61	31.60
Canada	1.02	0.81	0.77	1.08	1.16	0.82
Australia	0.05	0.44	0.55	0.41	0.42	0.44
India	0.21	0.90	1.15	1.05	1.35	1.30
Mexico	...	...	...	...	0.06	0.05
Japan	0.24	1.16	1.26	1.50	1.55	1.40
China	0.16	0.40	0.40	0.40	0.40	0.40
Total	77.90	77.52	85.40	86.94	97.23	79.10

*Partly estimated. Lorraine's output is included in Germany's in 1913, but in that of France since 1918.
Data revised from those previously published.

REFLECTING the world-wide business depression, production of both pig iron and steel for the world declined sharply last year. Pig iron was down close to the 1913 total but steel was considerably larger than in that pre-war year.

With the cooperation of the National Federation of Iron and Steel Manufacturers of London, England, it has been possible to assemble fairly accurate estimates of the pig iron output of 24 countries and of the steel ingot and casting production of 22 nations. These data are found in the accompanying tables.

Pig iron output approximated last year 79,100,000 gross tons, data for the last month or two in several cases being estimated. This is a decrease of 18.5 per cent from the record total for all time of 97,230,000 tons in 1929.

More pronounced was the decline in world steel production last year. The 1930 total, estimated on the same basis, was 93,600,000 tons for 22 producing nations. This is a drop of about 21 per cent from the record of 118,430,000 tons in 1929.

American pig iron output last year was 40 per cent of the world total while that for steel ingots and castings was 44 per cent. This contrasts with 43.8 per cent for pig iron and 47.8 per cent for steel in 1929. American pig iron production last year was 25.8 per cent

IN WORLD OUTPUT AND STEEL



under the 1929 total, with steel down 27 per cent.

The 17 European nations producing pig iron last year made 54.5 per cent of the world total against 51 per cent in 1929. The steel ingot and castings output of 14 European nations last year was 51 per cent of the total, as compared with 48.5 per cent in 1929.

New Records for Russia

A feature of operations in Europe was the heavy expansion in Russia. Last year new records for that nation were made in pig iron at 4,950,000 tons and in steel at 5,250,000 tons.

The decline last year in Germany was pronounced.

Reduced volume of exports from the six leading nations, exporting iron and steel, was recorded in 1930. Estimates place the total at 17,150,000 gross tons as against 21,080,000 tons in 1929, a decline of 19 per cent. Last year's total was the smallest since 1925 when it was 15,630,000 tons. As in 1929, Germany led, but each country showed a decrease from the previous year.

Imports into the same six countries also fell off. Last year's estimated total was 5,700,000 tons, contrasting with 6,140,000 tons in 1929. France is the only nation which showed an increase last year over 1929.

In the export and import data, scrap is not included.

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WORLD pig iron output for 1930, estimated at 79,100,000 gross tons, down 18.5 per cent from 1929.

Steel output for twenty-two nations last year, at 93,600,000 tons, 21 per cent under last year. Both smallest since 1926.

American proportion of world totals last year was 40 per cent for pig iron and 44 per cent for steel.

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Table of World Production of Steel Ingots and Castings in Millions of Gross Tons

Country	1913	1926	1927	1928	1929	1930*
United Kingdom	7.66	3.60	9.10	8.52	9.64	7.55
Germany	17.32	12.15	16.06	14.29	15.99	11.40
France	4.61	8.30	8.18	9.35	9.55	9.15
Belgium	2.43	3.32	3.66	3.87	4.07	3.35
Luxemburg	1.31	2.21	2.43	2.53	2.66	2.25
Saar	...	1.71	1.86	2.04	2.17	1.95
Russia	4.75	2.86	3.53	4.18	4.76	5.25
Poland	...	0.78	1.23	1.41	1.36	1.25
Sweden	0.58	0.49	0.49	0.57	0.68	0.60
Spain	0.30	0.60	0.65	0.78	0.97	0.85
Austria	2.58	0.47	0.55	0.63	0.62	0.55
Hungary		0.32	0.46	0.48	0.50	0.45
Czechoslovakia		1.55	1.60	1.71	2.11	2.00
Italy	0.92	1.75	1.57	1.93	2.11	1.80
United States	31.30	48.29	44.94	51.54	56.43	41.20
Canada	1.04	0.78	0.92	1.24	1.39	0.92
Australia	0.01	0.37	0.47	0.46	0.46	0.42
India	0.06	0.52	0.57	0.41	0.58	0.60
Mexico	...	...	...	...	0.10	0.08
South Africa	...	...	...	...	0.03	0.03
Japan	0.24	1.48	1.70	1.84	2.05	1.75
China	0.04	0.20	0.20	0.20	0.20	0.20
Total	75.15	91.75	100.17	107.98	118.42	93.60

*Partly estimated. Lorraine's output is included in Germany's in 1913, but in that of France since 1918.
Data revised from those previously published.

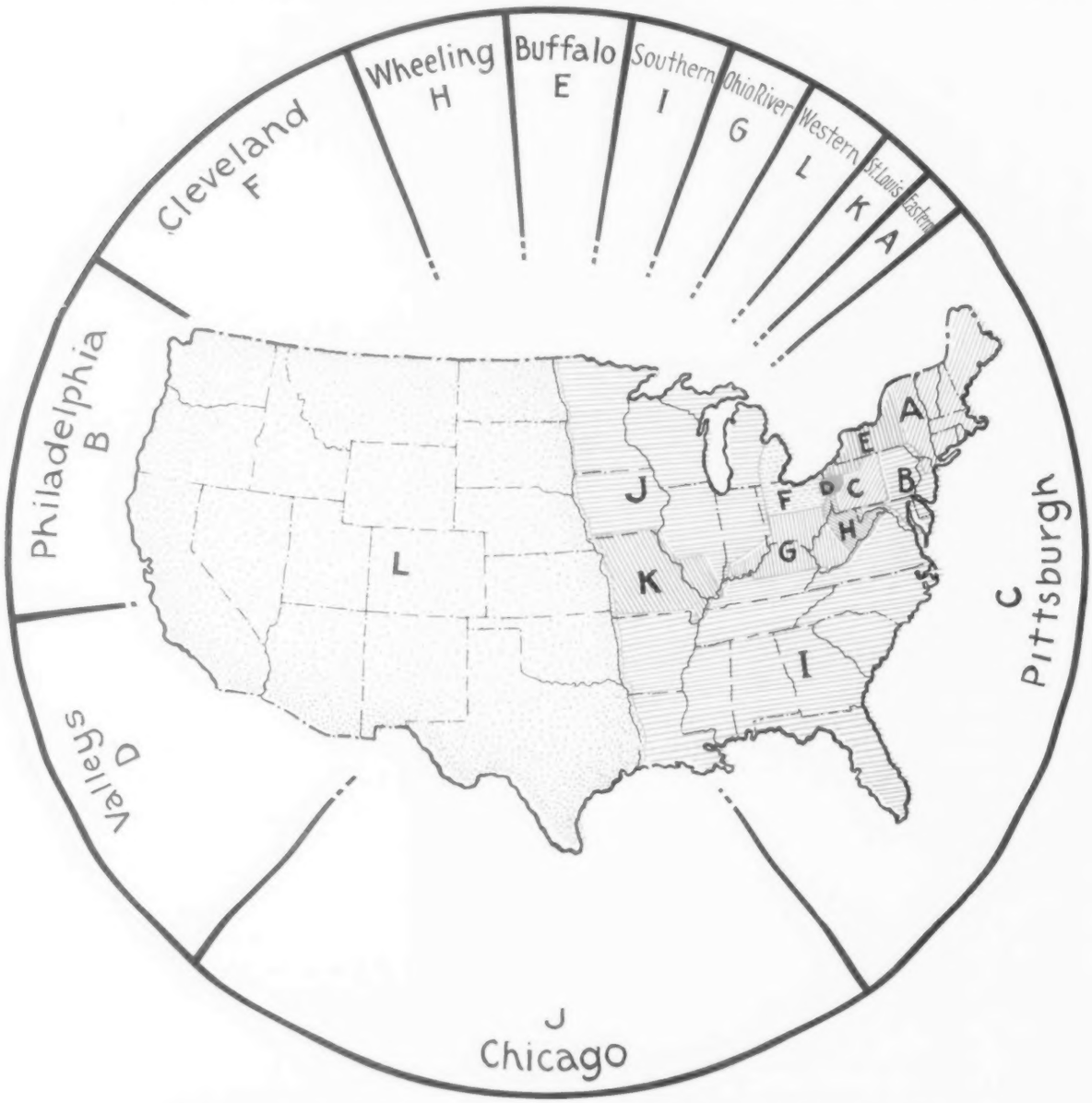
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STEEL-PRODUCING CAPACITY OF THE UNITED STATES

WHERE IT IS LOCATED AND HOW THE TOTAL IS SUBDIVIDED

SIX years ago on this date we published a comprehensive statement showing the steel-producing capacity of the United States, divided up into geographical districts and further sub-divided among the producing companies. This showed capacity for making ingots, total finished rolled capacity and the sub-division of the rolled product among the principal forms of steel, together with capacity for drawing wire.

A similar compilation presented herewith is derived from the 1930



Annual capacity for rolling iron and steel products in the twelve great producing districts of the United States.
Locations of the districts are shown by the letters. The circle is subdivided in proportion to the relative capacities of the twelve districts.

Steel-Producing Capacity of the United States (Gross Tons)

District	Total Ingots		Total Finished Rolled Product		Subdivision of Finished Rolled Product									Plain Wire (Net Tons)
	Tons	%	Tons	%	Rails	Sheared and Universal Plates	Structural Shapes	Merchant Bars, Bands, Hoops, etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Incl. Seamless)	Wire Rods	
Pittsburgh	16,136,100	24.3	14,594,100	26.11	726,000	2,009,900	1,635,300	4,095,400	361,700	1,006,500	549,700	2,965,600	1,304,000	903,200
Chicago	13,386,800	20.2	11,937,100	21.36	1,309,000	1,544,600	1,128,500	3,949,000	939,000	599,000	467,700	931,800	1,068,500	969,100
Valleys	7,966,000	12.0	6,440,600	11.52	.....	681,900	151,900	1,938,700	535,000	1,093,700	511,900	1,267,500	260,000	210,000
Philadelphia	7,863,400	11.9	6,331,000	11.33	600,000	1,566,400	1,538,000	1,222,500	57,000	395,500	204,000	407,600	340,000	311,500
Cleveland	7,699,600	11.6	5,533,000	9.90	90,000	203,500	.....	2,241,900	533,000	1,223,900	.....	731,700	489,000	365,000
Wheeling	3,246,600	4.9	2,547,600	4.56	.....	103,600	.....	118,000	850,000	657,000	586,000	233,000	.....	.....
Buffalo	2,839,000	4.3	2,207,600	3.95	275,000	95,000	520,000	1,000,200	.....	132,100	.....	.....	185,300	129,200
Southern	2,137,000	3.2	1,758,100	3.15	483,600	102,100	125,000	730,200	.....	99,200	.....	.....	218,000	302,000
Ohio River	1,874,700	2.8	1,437,000	2.57	65,000	.....	.....	217,000	.....	1,035,000	.....	.....	120,000	170,000
Western	1,819,400	2.7	1,422,900	2.55	315,000	18,000	173,000	689,900	.....	76,000	36,000	.....	115,000	159,600
St. Louis	910,000	1.4	930,800	1.67	.....	107,000	40,000	410,500	125,000	89,300	68,000	55,000	36,000	36,000
Eastern	483,100	0.7	762,400	1.36	.....	.....	.....	342,900	196,000	.....	.....	30,000	193,500	218,000
Total	66,361,700	100.0	55,902,200	100.0	3,863,600	6,432,000	5,311,700	16,956,200	3,596,700	6,407,200	2,423,300	6,582,200	4,329,300	3,773,600
Per Cent of Total	.....	.....	.....	.....	6.9	11.5	9.5	30.4	6.4	11.5	4.3	11.8	7.7	.....
Production in 1929	.....	.....	41,069,416	.....	2,722,138	5,022,139	4,778,020	8,937,251	2,502,793	5,715,531	1,698,640	4,322,225	3,134,409	.....
Per Cent of Cap'y.	.....	.....	73.5	.....	70.5	78.1	86.7	52.7	69.6	89.2	70.1	65.7	72.5	.....

PITTSBURGH DISTRICT

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT									Plain Wire (Net Tons)
			Rails	Sheared and Universal Plates	Structural Shapes	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Incl. Seamless Tubes)	Wire Rods	
Allegheny Steel Co., Brackenridge, Pa.	338,000	292,500	.....	80,000	.....	8,500	.....	180,000	.....	24,000	.....	.....
Altoona Iron Co., Altoona, Pa.	.....	24,000	.....	.....	.....	[a]24,000	.....	.....	.....	.....	.....	.....
American Rolling Mill Co., Butler, Pa.	570,000	239,000	.....	.....	.....	230,000	.....	.....	.....	.....	.....	.....
Amer. Sheet & Tin Plate Co., Leechburg, Pa.	.....	55,000	.....	.....	.....	.....	.....	55,000	.....	.....	.....	.....
Amer. Sheet & Tin Plate Co., Scottdale, Pa.	.....	60,800	.....	.....	.....	.....	.....	60,800	.....	.....	.....	.....
Amer. Sheet & Tin Plate Co., Vandergrift, Pa.	336,000	226,000	.....	.....	.....	.....	.....	226,000	.....	.....	.....	.....
Am. Sheet & Tin Plate Co. (Wood Wks.), McKeesport	.....	97,600	.....	24,800	.....	.....	.....	72,800	.....	.....	.....	.....
Am. Sheet & Tin Pl. Co. (Nat'l), Monessen, Pa.	.....	102,000	.....	.....	.....	.....	.....	.....	102,000	.....	.....	.....
Am. Sheet & Tin Pl. Co. (Pa.) New Kensington, Pa.	.....	33,900	.....	.....	.....	.....	.....	.....	33,900	.....	.....	.....
Amer. Sheet & Tin Plate Co., Morgantown, W. Va.	.....	39,800	.....	.....	.....	.....	.....	.....	39,800	.....	.....	.....
American Steel & Wire Co., Braddock, Pa.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	95,000
American Steel & Wire Co., Donora, Pa.	627,000	310,000	.....	.....	.....	.....	.....	.....	.....	.....	310,000	215,000
American Steel & Wire Co., Rankin, Pa.	.....	115,000	.....	.....	.....	.....	.....	.....	.....	.....	115,000	120,000
Apollo Steel Co., Apollo, Pa.	.....	160,000	.....	.....	.....	.....	.....	160,000	.....	.....	.....	.....
Babcock & Wilcox Tube Co., Beaver Falls, Pa.	.....	50,000	.....	.....	.....	.....	.....	.....	.....	50,000	.....	.....
Baltimore & Ohio R. R., Cumberland, Md.	.....	10,000	.....	.....	.....	10,000	.....	.....	.....	.....	.....	.....
Bethlehem Steel Corpn., Johnstown, Pa.	1,824,000	1,164,000	[c]12,000	240,000	[c]5,000	132,000 610,000	.....	.....	.....	.....	165,000	100,000
Braeburn Alloy Steel Corpn., Braeburn, Pa.	3,600	3,000	.....	.....	.....	[d]3,000	.....	.....	.....	.....	.....	.....
Byers Co., A. M., Pittsburgh	.....	90,000	.....	.....	.....	.....	.....	.....	.....	90,000	.....	.....
Canonsburg Steel Works, Canonsburg, Pa.	.....	38,000	.....	.....	.....	.....	.....	38,000	.....	.....	.....	.....
Carnegie Steel Co., Clairton, Pa.	720,000	525,000	.....	.....	393,000	132,000	.....	.....	.....	.....	.....	.....
Carnegie Steel Co., Duquesne, Pa.	1,510,000	998,500	.....	.....	.....	998,500	.....	.....	.....	.....	.....	.....
Carnegie Steel Co. (Edgar Thomson), Braddock, Pa.	1,445,000	811,000	694,000	.....	.....	117,000	.....	.....	.....	.....	.....	.....
Carnegie Steel Co. (Homestead), Munhall, Pa.	2,613,200	2,099,500	.....	1,335,200	764,300	.....	.....	.....	.....	.....	.....	.....
Colonial Steel Co., Colona, Pa.	57,600	20,000	.....	.....	.....	[d]20,000	.....	.....	.....	.....	.....	.....
Copperweld Steel Co., Rankin, Pa.	.....	30,000	.....	.....	.....	.....	.....	.....	.....	.....	30,000	10,000
Crucible Steel Co. of Am. (Crescent Wks.), Pittsburgh	63,000	15,000	.....	.....	.....	13,500	.....	1,500	.....	.....	.....	.....
Crucible Steel Co. of Am. (Park), Pittsburgh	124,000	105,700	.....	23,700	.....	75,000	.....	7,000	.....	.....	.....	.....
Crucible Steel Co. of Am. (LaBelle Wks.), Pittsburgh	24,800	26,700	.....	18,200	.....	6,800	1,700	.....	.....	.....	.....	.....
Edgewater Steel Co., Oakmont, Pa.	85,000	45,000	.....	.....	.....	45,000 (tires)	.....	.....	.....	.....	.....	.....
Firth-Sterling Steel Co., McKeesport, Pa.	12,600	6,000	.....	.....	.....	[e]6,000	.....	.....	.....	.....	.....	.....
Franklin Steel Works, Franklin, Pa.	.....	67,500	.....	.....	.....	67,500	.....	.....	.....	.....	.....	.....
Heppenstall Forge & Knife Co., Pittsburgh	25,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Jessop Steel Co., Washington, Pa.	5,600	18,000	.....	.....	.....	.....	.....	[a]18,000	.....	.....	.....	.....
Jones & Laughlin Steel Corpn., Pittsburgh	2,000,000	1,578,000	[c]20,000	288,000	365,000	785,000	.....	.....	.....	[f]120,000	.....	.....
Jones & Laughlin Steel Corpn., Aliquippa, Pa.	1,429,000	1,149,000	.....	.....	108,000	90,000	.....	.....	168,000	[f]489,000	294,000	.....
Latrobe Electric Steel Co., Latrobe, Pa.	15,800	11,000	.....	.....	.....	[d]11,000	.....	.....	.....	.....	.....	.....
Lockhart Iron & Steel Co., McKees Rocks, Pa.	.....	70,000	.....	.....	.....	[b]70,000	.....	.....	.....	.....	.....	.....
McKeesport Tinplate Co., Portvue, Pa.	.....	180,000	.....	.....	.....	.....	.....	.....	180,000	.....	.....	.....
National Tube Co., McKeesport, Pa.	704,000	547,600	.....	.....	.....	.....	.....	.....	.....	547,600	.....	.....
National Tube Co. (Penna.), Pittsburgh	.....	300,000	.....	.....	.....	.....	.....	.....	.....	300,000	.....	.....
National Tube Co., Ellwood City, Pa.	.....	350,000	.....	.....	.....	.....	.....	.....	.....	350,000	.....	.....
Page Steel & Wire Co., Monessen, Pa.	65,000	90,000	.....	.....	.....	.....	.....	.....	.....	.....	90,000	110,000
Penn Iron & Steel Co., Creighton, Pa.	.....	12,000	.....	.....	.....	[b]12,000	.....	.....	.....	.....	.....	.....
Pittsburgh Crucible Steel Co., Midland, Pa.	660,000	360,000	.....	.....	.....	360,000	.....	.....	.....	.....	.....	.....
Pittsburgh Forge & Iron Co., Pittsburgh	.....	25,000	.....	.....	.....	20,000	.....	.....	.....	[c]5,000	.....	.....
Pittsburgh Steel Co., Monessen, Pa.	720,000	300,000	.....	.....	.....	.....	.....	.....	.....	.....	300,000	253,00
Pittsburgh Steel Co., Glassport, Pa.	.....	35,000	.....	.....	.....	35,000	.....	.....	.....	.....	.....	.....
Pittsburgh Steel Products Co., Monessen, Pa.	.....	280,000	.....	.....	.....	.....	.....	.....	.....	[f]280,000	.....	.....
Railway Steel Spring Co., Latrobe, Pa.	102,500	100,000	.....	.....	.....	100,000	.....	.....	.....	.....	.....	.....
Republic-Dilworth, Porter & Co., Pittsburgh	.....	90,000	.....	.....	.....	90,000	.....	.....	.....	.....	.....	.....
Spang-Chalfant & Co., Etna, Pa.	.....	300,000	.....	.....	.....	.....	.....	.....	.....	300,000	.....	.....
Spang-Chalfant & Co., Ambridge, Pa.	.....	350,000	.....	.....	.....	.....	.....	.....	.....	[f]350,000	.....	.....
Standard Tin Plate Co., Canonsburg, Pa.	.....	104,400	.....	.....	.....	.....	.....	104,400	.....	.....	.....	.....
Superior Steel Corp., Carnegie, Pa.	.....	120,000	.....	.....	.....	.....	120,000	.....	.....	.....	.....	.....
Tarentum Steel Corpn., Tarentum, Pa.	.....	50,000	.....	.....	.....	.....	.....	50,000	.....	.....	.....	.....
Taylor (N. & G.) Co., Cumberland, Md.	.....	20,000	.....	.....	.....	.....	.....	20,000	.....	.....	.....	.....
Universal Steel Co., Bridgeville, Pa.	50,700	28,000	.....	.....	.....	15,000	.....	13,000	.....	.....	.....	3,200
Vanadium Alloy Steel Co., Latrobe, Pa.	4,500	2,600	.....	.....	.....	[d]2,600	.....	.....	.....	.....	.....	.....
Vulcan Crucible Steel Co., Aliquippa, Pa.	8,700	6,000	.....	.....	.....	[e]6,000	.....	.....	.....	.....	.....	.....
Washington Tin Plate Co., Washington, Pa.	.....	26,000	.....	.....	.....	.....	.....	.....	26,000	.....	.....	.....
West Leechburg Steel Co., Leechburg, Pa.	.....	240,000	.....	.....	.....	.....	240,000	.....	.....	.....	.....	.....
Totals	16,136,100	14,594,100	726,000	2,009,900	1,635,300	4,095,400	361,700	1,006,500	549,700	2,965,600	1,304,000	903,200

[a] Light sections. [b] Iron. [c] Skelp. [d] Tool steel. [e] Skelp and rounds for seamless tubes. [f] Seamless tubes.

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT									
			Rails	Sheared and Universal Plates	Structural Shapes	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Incl. Seamless Tubes)	Wire Rods	Plain Wire (Net Tons)
EASTERN DISTRICT												
American Steel & Wire Co., Worcester, Mass.	190,000	170,500				5,000	12,000				160,500	180,000
American Steel & Wire Co., New Haven, Conn.												27,000
Ames (W.) & Co., Jersey City, N. J.		12,000				12,000						
Bancroft & Martin Rolling Mill Co., S. Portland, Me.		18,000				[a] 18,000						
Burden Iron Co., Troy, N. Y.		47,000				[b] 47,000						
Chrome Steel Corpn., Carteret, N. J.		40,000				40,000						
Cohoes Rolling Mill Co., Cohoes, N. Y.		30,000								[c] 30,000		
Crucible Steel Co. of America, Harrison, N. J. (Atha)	86,000	82,000				82,000						
Driver-Harris Co., Harrison, N. J.	1,600	2,000				1,000					1,000	3,000
Heller Brothers Co., Newark, N. J.	1,500	11,000				[d] 11,000						
Ludlum Steel Co., Watervliet, N. Y.	45,000	31,000				[d] 24,000					7,000	2,000
Rail Joint Co., Troy, N. Y.		20,000				20,000						
Rockaway Rolling Mill, Rockaway, N. J.		30,000				30,000						
Rome Iron Mills, Rome, N. Y.		8,900				[e] 8,900						
Singer Mfg. Co., Elizabethport, N. J.		15,000				15,000						
Stanley Works, Bridgeport, Conn.	120,000	125,000					125,000					
Stanley Works, New Britain, Conn.		35,000					35,000					
Tidewater Rolling Mills, Newark, N. J.		12,000				12,000						
Ulster Iron Works, Dover, N. J.		17,000				[b] 17,000						
Washburn Wire Co., Phillipsdale, R. I.	39,000	49,000					24,000				25,000	6,000
Totals	483,100	762,400				342,900	196,000			30,000	193,500	218,000

[a] Iron. [b] Tool steel.

PHILADELPHIA DISTRICT

Alan Wood Iron & Steel Co., Ivy Rock, Pa.	600,000	125,000		125,000								
Alan Wood Iron & Steel Co., Conshohocken, Pa.		100,000						100,000				
American Bridge Co., Pencoyd, Pa.	240,000	222,000			198,000	24,000						
American Car & Foundry Co., Berwick, Pa.		48,000				[a] 48,000						
American Steel & Wire Co., Allentown, Pa.		105,000									105,000	115,000
American Steel & Wire Co., Trenton, N. J.												26,000
Bethlehem Steel Corpn., Bethlehem, Pa.	1,681,000	1,275,000			1,100,000	175,000						
Bethlehem Steel Corpn., Steelton, Pa.	660,000	475,500	360,000			115,500						
Bethlehem Steel Corpn., Sparrows Point, Md.	1,749,000	1,101,000	180,000	235,000				127,000	204,000	230,000	125,000	80,500
Bethlehem Steel Corpn., Lebanon, Pa.		140,000				[b] 140,000						
Bethlehem Steel Corpn., Coatesville, Pa.	336,000	255,000		231,000						24,000		
Bethlehem (Danville) Struc'l Tubing Co., Danville, Pa.		24,000				24,000						
Carpenter Steel Co., Reading, Pa.	43,000	25,000				[d] 25,000						
Central Iron & Steel Co., Harrisburg, Pa.	250,000	200,000		188,000				12,000				
Delaware Seamless Tube Co., Auburn, Pa.		3,600								3,600		
Disston (Henry) & Sons, Inc., Philadelphia	16,000	34,500		5,000		15,000	5,000	9,500				
Eastern Rolling Mill Co., Baltimore		100,000						100,000				
Eastern Steel Co., Pottsville, Pa.	144,000	90,000			90,000							
Eddystone Steel Co., Crum Lynne, Pa.		30,000						30,000				
Edwards, E. T., Columbia, Pa.		32,000				32,000						
Federal Alloy Steel Corpn., Eddystone, Pa.	35,000	60,000				60,000						
Glasgow Iron Co., Pottstown, Pa.		82,000		82,000								
Harrisburg Pipe & Bending Co., Harrisburg, Pa.	80,000	49,000				9,000	40,000					
Hughes & Patterson, Philadelphia		15,000				[b] 15,000						
Illingworth (John) Steel Co., Frankford, Pa.	3,000	25,000				[d] 25,000						
Janson Steel & Iron Co., Columbia, Pa.		15,000				15,000						
Logan Iron & Steel Co., Burnham, Pa.		45,000				[b] 45,000						
Lukens Steel Co., Coatesville, Pa.	686,500	463,400		463,400								
Midvale Co. (c) Nicetown, Philadelphia	200,000	15,000				15,000						
Milton Mfg. Co., Milton, Pa.		40,000				40,000						
Nicetown Plate Washer Co., Philadelphia		12,000				12,000						
Parkesburg Iron Co., Parkesburg, Pa.												
Penn-Seaboard Steel Corpn., New Castle, Del.[a]	160,000											
Phoenix Iron Co., Phoenixville, Pa.	223,800	150,000			150,000							
Phoenix Mfg. Co., Catasauqua, Pa.		6,000				6,000						
Pine Iron Works Co., Pine Forge, Pa.		12,000		12,000								
Reading Iron Co., Reading, Pa.		185,000				35,000				150,000		
Reading Iron Co., Pottstown, Pa.		12,000						[e] 12,000				
Roebling's (John A.) Sons Co., Tren'n & Kinkora, N. J.	231,000	122,000					12,000				110,000	90,000
Rustless Iron Corpn. of America, Baltimore	[a] 20,000	15,000				15,000						
Standard Steel Works Co., Burnham, Pa.	145,100	102,000				[f] 102,000						
Sweets Steel Co., Williamsport, Pa.		100,000	[g] 60,000			40,000						
Van Alen & Co., Northumberland, Pa.		5,000						[e] 5,000				
Worth Steel Co., Claymont, Del.	360,000	225,000		225,000								
Wrought Iron Co. of Amer., Lebanon & Scranton, Pa.		190,000				[b] 190,000						
Totals	7,863,400	6,331,000	600,000	1,566,400	1,538,000	1,222,500	57,000	395,500	204,000	407,600	340,000	311,500

[a] Plant for sale. [b] Iron [c] Much semi-finished forging steel. [d] Tool steel. [e] Nail plate. [f] Wheels, tires, etc. [g] Re-rolled rails. [h] Electric.

ST. LOUIS DISTRICT

American Car & Foundry Co., St. Louis		40,000				[a] 40,000						
Granite City Steel Co., Granite City, Ill.	360,000	240,300		95,000				77,300	68,000			
Laclede Steel Co., Madison, Ill.		100,000				100,000						
Laclede Steel Co., Alton, Ill.	225,000	180,000				43,000	125,000			[b] 15,000		
Laclede Tube Co., Alton, Ill.		40,000								40,000		
Missouri Rolling Mill Corpn., St. Louis		20,000				20,000						
St. Louis Screw & Bolt Co., St. Louis		5,500				5,500						
Scullin Steel Co., St. Louis	115,000	125,000			40,000	85,000						
[a] Sheffield Steel Corpn., Kansas City, Mo.	210,000	180,000		12,000		120,000		12,000			36,000	36,000
Totals	910,000	930,800		107,000	40,000	410,500	125,000	89,300	68,000	55,000	36,000	36,000

[a] Subsidiary of American Rolling Mill Co. [b] Iron. [c] Skelp.

CLEVELAND DISTRICT

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT										Plain Wire (Net Tons)
			Rails	Sheared and Universal Plates	Structural Shapes [a]	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Inc. Seamless Tubes)	Wire Rods		
Am. Sheet & Tin Plate Co., Dover, Ohio		63,800						63,800					
Amer. Steel & Wire Co. (American), Cleveland		120,000									120,000		70,000
Amer. Steel & Wire Co. (Consolidated), Cleveland		105,000									105,000		90,000
Amer. Steel & Wire Co. (Cuyahoga), Cleveland		294,000					144,000				150,000		105,000
Amer. Steel & Wire Co. (Newburgh), Cleveland	800,000	84,000									84,000		100,000
Cleveland Hardware Co., Cleveland		5,900						75,000					
Continental Steel Co. (Superior), Canton, Ohio		75,000				268,000							
Corrigan-McKinney Steel Co., Cleveland [a]	1,000,000	268,000				5,900							
Detroit Seamless Steel Tubes Co., Detroit		30,000								[d]30,000			
Empire Steel Corpn., Mansfield, Ohio (3 plants)	333,000	235,100						235,100					
Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio		2,000				[b]2,000							
Ford Motor Co., Detroit	519,400	480,000				480,000							
Michigan Steel Corpn., Ecorse, Mich.		175,000						175,000					
National Steel Corpn. (Gt. Lakes), Ecorse, Mich.	600,000												
National Tube Co., Lorain, Ohio	1,500,000	1,034,700	90,000			426,000				518,700			
Newton Steel Co., Monroe, Mich.		200,000						200,000					
Ohio Seamless Tube Co., Shelby, Ohio		15,000								[d]15,000			
Otis Steel Co., Cleveland	990,000	558,500		203,500			235,000	120,000					
Reeves Mfg. Co., Dover, Ohio		50,000						50,000					
Republic-Bourne-Fuller Co. (Un'n Mills), Cleveland		150,000				150,000							
Republic-Bourne-Fuller Co. (Upson Wks.), Cleveland	350,000	180,000				180,000							
Republic-Central Alloy Steel Corpn., Canton, Ohio	850,000	611,000				390,000		215,000			6,000		
Republic-Central Steel Co., Massillon, Ohio	450,000	530,000				340,000	100,000	90,000					
Republic (Steel & Tubes, Inc.), Elyria, Ohio		78,000					54,000			[c]24,000			
Timken Steel & Tube Co., Canton, Ohio	307,200	188,000								164,000	24,000		
Totals	7,699,600	5,533,000	90,000	203,500		2,241,900	533,000	1,223,900		751,700	489,000		365,000

[a] Rolls mainly semi-finished steel. [b] Iron. [c] Skelp. [d] Seamless tube blanks.

VALLEY DISTRICT

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT										Plain Wire (Net Tons)
			Rails	Sheared and Universal Plates	Structural Shapes [a]	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Inc. Seamless Tubes)	Wire Rods		
Am. Sheet & Tin. P. Co., (Mercer Wks.), Farrell, Pa.		78,700						78,700					
Am. Sheet & Tin P. Co. (Farrell), Farrell, Pa.		121,300							121,300				
Am. Sheet & Tin P. Co., (Newcastle) Newcastle, Pa.		83,200							83,200				
Am. Sheet & Tin P. Co. (Shenango), Newcastle, Pa.		162,400							162,400				
Am. Steel & Wire Co., Farrell, Pa.		150,000									150,000		100,000
Carnegie Steel Co., Farrell, Pa.	780,000	157,000		157,000									
[a]Carnegie Steel Co., Neweastle, Pa.	500,000												
[a]Carnegie Steel Co. (Ohio Wks.), Youngstown	1,700,000												
Carnegie Steel Co., McDonald, Ohio		826,000		3,900	86,700	506,900				[c]228,500			
Carnegie Steel Co. (Upper Union), Youngstown		290,000			[c]56,600	214,400				[c]19,000			
Carnegie Steel Co. (Lower Union), Youngstown		171,000			8,600	162,400							
Empire Steel Corpn., Niles, Ohio (3 plants)		233,000						233,000					
Mahoning Valley Steel Co., Niles, Ohio		60,000						60,000					
Newton Steel Co., Newton Falls, Ohio		200,000						200,000					
Republic Steel Corpn., Niles, Ohio		110,000						110,000					
Republic Steel Corpn., Youngstown, Ohio	1,440,000	837,000		141,000		381,000			45,000	270,000			
Republic (Trumbull), Warren, Ohio	756,000	678,000					535,000	43,000	100,000				
Sharon Steel Hoop Co., Lowellville, Ohio [a]	450,000												
Sharon Steel Hoop Co., Sharon, Pa.		424,000				424,000							
Sharon Steel Hoop Co., Youngstown, Ohio		107,000						107,000					
Wilkes Rolling Mill Co., Sharon, Pa.		5,000						[b]5,000					
Youngstown Sheet & Tube Co., Campbell, Ohio	1,560,000	850,000						100,000		750,000			
Brier Hill Works, Youngstown, Ohio	780,000	452,000		380,000				72,000					
West Reserve Works, Warren, Ohio		85,000						85,000					
Struthers Works, Struthers, Ohio		360,000				250,000					110,000		110,000
Totals	7,966,000	6,440,600		681,900	151,900	1,938,700	535,000	1,093,700	511,900	1,267,500	260,000		210,000

[a] Rolls semi-finished steel [b] Iron. [c] Skelp. [d] Light shapes.

WHEELING DISTRICT

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT										Plain Wire (Net Tons)
			Rails	Sheared and Universal Plates	Structural Shapes [a]	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Inc. Seamless Tubes)	Wire Rods		
Am. Sheet & Tin. Plate Co. (Aetna), Bridgeport, O.		46,400		33,600				12,800					
Am. Sheet & Tin Pl. Co. (Guernsey), Cambridge, Ohio		59,000						59,000					
Am. Sheet & Tin Plate Co., New Philadelphia, Ohio		86,400						86,400					
Am. Sheet & Tin Plate Co., Wellsville, Ohio		52,000						52,000					
Am. Sheet & Tin Plate Co., Cambridge, Ohio		35,800							35,800				
Am. Sheet & Tin Plate Co., Chester, W. Va.		35,200							35,200				
Am. Sheet & Tin Pl. Co. (Laughlin) Martins Ferry, O.		92,000							92,000				
Carnegie Steel Co., Mingo Junction, Ohio	600,000	65,000				65,000							
Follansbee Brothers Co., Follansbee, W. Va.	90,000	65,000						40,000	25,000				
Follansbee Brothers Co., Toronto, Ohio	110,000	84,800						84,800					
Monongahela Iron & Steel Co., Paden City, W. Va.		5,000				[b]5,000							
Parkersburg Iron & Steel Co., Parkersburg, W. Va.		30,000						30,000					
Robertson (W. F.) Steel & Iron Co., Marietta, Ohio		45,000							45,000				
[a]Weirton Steel Co., Weirton, W. Va.	1,250,000	965,000					750,000	100,000	115,000				
[a]Weirton Steel Co., Clarksburg, W. Va.		55,000							55,000				
[a]Weirton Steel Co., Steubenville, Ohio		55,000							55,000				
Wheeling Steel Corpn., Steubenville, Ohio	900,000	242,000					100,000	57,000		85,000			
Wheeling Steel Corpn. (LaBelle Wks.), Wheeling		70,000		70,000									
Wheeling Steel Corpn., Benwood, W. Va.	296,600	148,000								148,000			
Wheeling Steel Corpn. (Whitaker Wks.), Wheeling		67,000						39,000	28,000				
Wheeling Steel Corpn., Beech Bottom, W. Va.		56,000						56,000					
Wheeling Steel Corpn., Yorkville, Ohio		100,000							100,000				
Wheeling Steel Corpn., Martins Ferry, Ohio		40,000						40,000					
White, J. W., Cambridge, Ohio		48,000				48,000							
Totals	3,246,600	2,547,600		103,600		118,000	[b]850,000	657,000	586,000	233,000			

[a]Part of National Steel Corpn. [b]Iron.

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT									Plain Wire (Net Tons)
			Rails	Sheared and Universal Plates	Structural Shapes	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Incl. Seamless Tubes)	Wire Rods	
CHICAGO DISTRICT												
Acme Steel Co., Chicago		450,000				450,000						
Amer. Sheet & Tin Plate Co., Gary, Ind.		345,600 636,500		121,600		[a]	360,000	224,000	276,500			
Amer. Sheet & Tin Plate Co., Elwood, Ind		81,200							81,200			
Amer. Steel & Wire Co., DeKalb, Ill.												100,000
American Steel & Wire Co., Joliet, Ill.												105,000
American Steel & Wire Co., Rockdale, Ill.												110,000
American Steel & Wire Co., Waukegan, Ill.		225,000									225,000	181,500
American Steel & Wire Co., Anderson, Ind.		105,000									105,000	75,000
Atch., Topeka & Santa Fe R.R. Co., Corwith, Chic.		11,700				11,700						
Calumet Steel Co., Chicago Heights, Ill.		50,000				50,000						
Chapman-Price Steel Corpn., Indianapolis		45,000						45,000				
Columbia Tool Steel Co., Chicago Heights, Ill.	8,800	1,500				[d]1,500						
Continental Steel Corpn., Kokomo, Ind.	250,000	170,000						50,000			120,000	120,000
Gary Tube Co., Gary, Ind.		421,800								421,800		
Globe Seamless Steel Tube Co., Milwaukee		50,000								50,000		
Great Northern Railway Co., St. Cloud, Minn.		4,200				4,200						
Highland Iron & Steel Co., Terre Haute, Ind.		60,000				60,000						
Illinois Steel Co., Gary, Ind.	4,428,000	3,301,500	960,000	480,000	168,500	1,117,000	576,000					
Illinois Steel Co., Joliet, Ill.	660,000	405,100				153,400					252,000	
Illinois Steel Co., Milwaukee		242,800	1,000			241,800						
Illinois Steel Co., South Chicago	3,198,000	1,466,400	48,000	636,000	461,200 102,800	218,400						
Indiana Rolling Mill Co., New Castle, Ind.	10,000	60,000						60,000				
Inland Steel Co., Chicago Heights, Ill.		60,000				60,000						
Inland Steel Co., Ind. Harbor, Ind., and Milwaukee	2,000,000	1,470,000	240,000	250,000	320,000	440,000		220,000				
International Harvester Co., South Chicago, Ill.	732,000	480,000		57,000	76,000	281,000				[c]65,000	1,000	
Intern'l Harvester Co. (Deering Wks.), Chicago		34,000				34,000						
Joslyn Mfg. & Supply Co., Chicago and Fort Wayne		65,000				65,000						
Keystone Steel & Wire Co., Peoria, Ill.	180,000	150,000									150,000	135,000
McKenna Process Co., Joliet, Ill.		75,000	60,000			15,000						
Minnesota Steel Co., Duluth, Minn.	540,000	220,000				120,000					100,000	97,600
Phoenix Mfg. Co., Joliet, Ill.		15,000				15,000						
Railway Steel Spring Co., Chicago Heights, Ill.	80,000	70,000				[c]70,000						
Republic-Interstate Iron & Steel Co., Chicago	400,000	510,500				395,000					60,000 55,500	45,000
Republic Steel Corpn., Moline, Ill.		54,000				54,000						
Sellers Mfg. Co., Chicago		50,000				50,000						
Simmons Co., Kenosha, Wis.		40,000				40,000						
Wrought Washer Mfg. Co., Milwaukee		5,000					5,000					
Youngstown Sheet & Tube Co., Evanston, Ill.		125,000								125,000		
Youngstown Sheet & Tube Co., Indiana Harbor, Ind.	900,000	380,000							110,000	270,000		
Totals	13,386,800	11,937,100	1,309,000	1,544,600	1,128,500	3,947,000	941,000	599,000	467,700	931,800	1,068,500	969,100

[a] Forging Steel [c] Skelp [d] Tool Steel.

BUFFALO DISTRICT

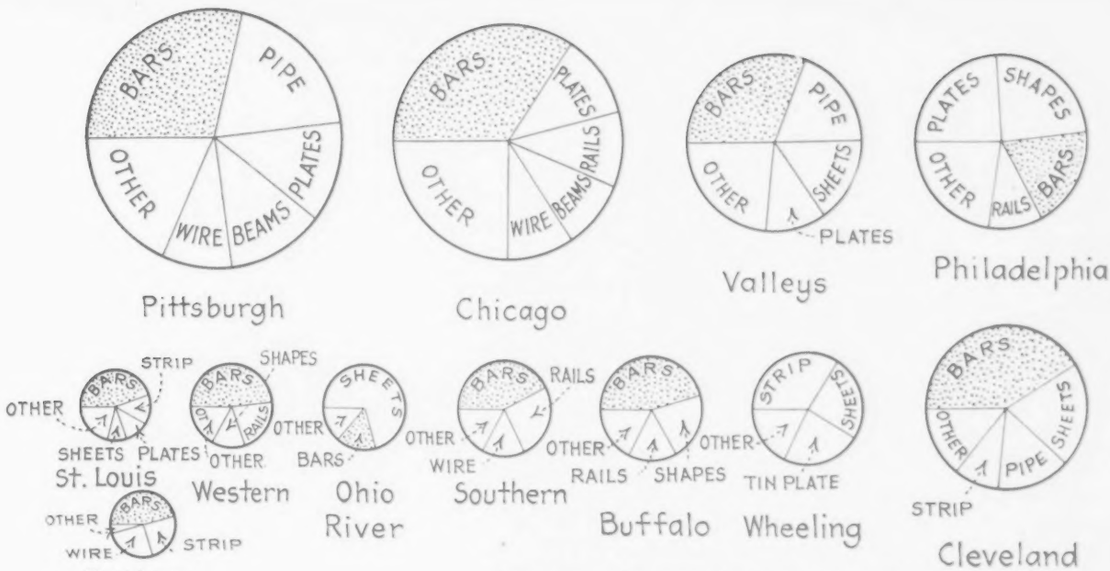
Bethlehem Steel Corpn., Lackawanna, N. Y.	1,980,000	1,320,000	275,000	95,000	520,000	430,000						
Buffalo Bolt Co., North Tonawanda, N. Y.		60,000				40,000					20,000	20,000
Buffalo Steel Co., Tonawanda, N. Y.		60,000				60,000						
Crucible Steel Co. of Amer., Syracuse, N. Y.	15,000	10,700				9,400					1,300	1,200
Cyclops Steel Co., Titusville, Pa.	9,800	7,000				[d]7,000						
Republic-Donner Steel Co., Buffalo	560,000	410,000				410,000						
Eckels-Nye Steel Co., Syracuse, N. Y.		10,000				10,000						
Elmira Steel Co., Elmira, N. Y.		12,000				12,000						
Halcomb Steel Co., Syracuse, N. Y.	51,800	30,000				[d]17,400		3,600			9,000	8,000
McInnes Steel Co., Corry, Pa.	[a]1,000	1,000				[d]1,000						
Onondaga Steel Co., Syracuse, N. Y.	[c]400	1,000				[d]1,000						
Seneca Iron & Steel Co., Blasdell, N. Y.		120,000						120,000				
Simonds Saw & Steel Co., Lockport, N. Y.	[d]11,000	8,500						8,500 sawplate				
Tuttle, Charles W., Auburn, N. Y.		2,400				[b]2,400						
Wickwire Brothers, Cortland, N. Y.	35,000	35,000									35,000	22,000
Wickwire Spencer Steel Co., Buffalo	175,000	120,000									120,000	78,000
Totals	2,839,000	2,207,600	275,000	95,000	520,000	1,000,200		132,100			185,300	129,200

[a] Crucible. [b] Iron. [c] Electric. [d] Tool Steel.

OHIO RIVER DISTRICT

American Rolling Mill Co., Middletown, Ohio	508,700	266,000						266,000				
American Rolling Mill Co., Zanesville, Ohio		67,000						67,000				
American Rolling Mill Co., Ashland, Ky.	588,000	360,000						360,000				
Andrews Steel Co., Newport, Ky. [a]	360,000											
Belfont Steel & Wire Co., Ironton, Ohio												50,000
Buckeye Rolling Mill Co., Newark, Ohio		60,000				60,000						
Ewald Iron Co., Louisville, Ky.		12,000				[b]12,000						
Newport Rolling Mill Co., Newport, Ky.		150,000						150,000				
Ohio Falls Iron Co., New Albany, Ind.		60,000				60,000						
Pollak Steel Co., Marion, Ohio		50,000				50,000						
West Virginia Rail Co., Huntington, W. Va.		100,000	[c]65,000			35,000						
Wheeling Steel Corpn., Portsmouth, Ohio	418,000	312,000						192,000			120,000	120,000
Totals	1,874,700	1,437,000	65,000			217,000		1,035,000			120,000	170,000

[a] Rolls semi-finished steel: capacity, 300,000 tons. [b] Iron. [c] Rerolled rails.



Circles showing the principal products made in the twelve producing districts. Circles are proportional to district total capacity.

directory of the iron and steel industry, published by the American Iron and Steel Institute. As such it represents the situation as it existed about a year ago, with some correction for known additions to capacity during the intervening 12 months.

Along with the general tabulation, company by company, will be found summaries showing the relative sizes of the 12 districts into which the country is now divided (there were 14 such districts six years ago) and the percentage relationship of each of these districts in each of the principal forms of steel to the Pittsburgh district.

Changes from the condition of six years ago have been considerable. There has been more of a movement toward the Middle West, resulting in further reducing the previous preponderance of the Pittsburgh district and augmenting that of the Chicago district and that around Cleveland.

Duluth in the previous list was a part of the Chicago district.

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT									
			Rails	Sheared and Universal Plates	Structural Shapes	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Inc. Seamless Tubes)	Wire Rods	Plain Wire (Net Tons)
SOUTHERN DISTRICT												
American Steel & Wire Co., Fairfield, Ala.		110,000									110,000	102,000
Atlantic Steel Co., Atlanta, Ga.	100,000	84,500			3,500	63,000					18,000	20,000
Connors Steel Co., Birmingham, Ala.		65,000				65,000						
Gulf States Steel Co., Alabama City, Ala.	280,000	200,000			15,000	95,000					90,000	180,000
Kilby Car & Foundry Co., Anniston, Ala.		15,000				15,000						
Knoxville Iron Co., Knoxville, Tenn.		42,000			13,000	29,000						
Old Dominion Iron & Steel Works, Richmond, Va.	[a]5,000	5,000				5,000						
Southern Steel & Rolling Mill, Birmingham, Ala.		18,000				18,000						
Tenn. Coal, Iron & R. R. Co., Ensley, Ala.	1,020,000	480,000	480,000									
Tenn. Coal, Iron & R. R. Co., Bessemer, Ala.		67,000			5,000	62,000						
Tenn. Coal, Iron & R. R. Co., Fairfield, Ala.	732,000	624,600	3,600	102,100	88,500	331,200		99,200				
Tredegar Co., Richmond, Va.		47,000				47,000						
Totals	2,137,000	1,758,100	483,600	102,100	125,000	730,200		99,200			218,000	302,000

[a]Electric.

Company and Location	Total Ingots	Total Finished Rolled Product	SUBDIVISION OF FINISHED ROLLED PRODUCT									
			Rails	Sheared and Universal Plates	Structural Shapes	Merchant Bars, Bands, Hoops, Etc.	Strip Steel	Sheets and Light Plates	Black Plate for Tinning	Tubular Products (Inc. Seamless Tubes)	Wire Rods	Plain Wire (Net Tons)
WESTERN DISTRICT												
Botchford Steel Co., Emeryville, Calif.	60,000	40,000				40,000						
Colorado Fuel & Iron Co., Pueblo, Colo.	[a]98,000	630,000	315,000		35,000	205,000					75,000	120,000
[a]Columbia Steel Corpn., Pittsburg, Calif.	176,000	173,600				57,600		40,000	36,000		40,000	39,600
Columbia Steel Corpn., Torrance, Calif.	164,000	112,000			27,500	48,500		36,000				
Northwest Steel Rolling Mills, Seattle	[a]15,000	12,000				12,000						
[b]Pacific Coast Steel Corpn., Youngstown (Seattle), Wash.	140,000	122,000		18,000	28,000	76,000						
[b]Pacific Coast Steel Corpn., San Francisco	155,000	132,000			52,500	79,500						
Simmons Co., San Francisco		10,000				10,000						
[a]Sou. Calif. Iron & Steel Co., Huntington Prk, Cal.	85,000	66,500				66,500						
Southern Pacific Co., Sacramento, Cal.	[a]9,000	21,200				21,200						
Texas Steel Co., Fort Worth, Texas	[a]11,000	15,000				15,000						
Tulsa Rolling Mills Co., Tulsa, Okla.	60,000	45,000				45,000						
United Steel Co., Lowell, Wash.		3,600				3,600						
Western Steel & Foundry Co., Midvale, Utah	46,000	40,000			30,000	10,000						
Totals	1,819,400	1,422,900	315,000	18,000	173,000	689,900		76,000	36,000		115,000	159,600

[a]Subsidiary of United States Steel Products Co. [b]Subsidiary of Bethlehem Steel Corporation. [c]Electric furnaces only.

For every 1000 *tons of capacity in the Pittsburgh District, the others have capacity as listed below*

	Ingots	Total Rolled	Rails	Plates	Shapes	Bars, Etc.	Strip	Sheets	Tin Plate	Pipe	Wire Rods
Pittsburgh	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Chicago	830	818	1,803	769	691	964	2,594	595	851	321	820
Valleys	494	441	..	339	93	474	1,478	1,086	929	436	159
Philadelphia	487	434	826	779	941	298	157	392	371	140	261
Cleveland	477	379	124	101	...	548	1,472	1,216	...	259	375
Wheeling	201	175	..	51	...	29	2,348	652	1,066	80	..
Buffalo	176	151	379	47	318	244	...	131	...	...	142
Southern	132	120	667	51	76	178	...	98	...	...	167
Ohio River	116	99	90	..	..	53	...	1,028	..	...	92
Western	113	98	434	9	106	169	...	75	66	..	88
St. Louis	56	64	..	53	24	100	345	88	124	19	28
Eastern	30	52	..	..	...	84	539	...	...	10	148

whereas the far West, which was included with Chicago six years ago, is now by itself. Detroit was separately considered then, but is now regarded as a part of the Cleveland district. Johnstown has been merged with the Pittsburgh district, Columbus has disappeared, but the Ohio River district has been made, including plants on both sides of the river between the Wheeling district and Indiana.

Excess Rolling Capacity

NATURALLY the capacity for rolling steel is considerably greater than that for producing ingots. Accepting the usual ratio of about 74 per cent of the tonnage of ingots appearing as tonnage of finished steel, the present 66,361,700 tons of ingots would represent 49,100,000 tons of rolled and finished product. But the capacity for producing product of this character is listed as 55,902,200 tons, or about 14 per cent in excess of the break-down of the ingot capacity feeding the mills. The largest engagement of rolling mill capacity—that of 1929, with 41,069,416 tons,—was at 73.5 per cent.

Comparing productive capacity with actual output of various forms of steel, it is found that some classes of mills are in much greater current use than others. Thus, the bar mills, which produce a wide variety of output, were engaged (on the basis of 1929 total production) to the extent of only 52.7 per cent. Structural mills, on the other hand, made about 86 per cent of the total for which capacity exists; rail mills made 70.5 per cent, and sheet mills, almost 90 per cent. Plate mills were engaged to the extent of about 78 per cent and pipe mills of the various types about 66 per cent.

Value Rather than Volume Is Key to Profits

(*Concluded from page* 83)

tinued policies. Each phase of the business has apparently been subordinated to their price policies. Regular and steady growth is a prerequisite to regular and increasing profits. Better manufacturing methods and improved plant facilities result not only in greater capacity and lower costs but are more conducive to profits than added capacity which is dependent upon volume for reduced costs.

Volume Producers Cut Prices at Wrong Time

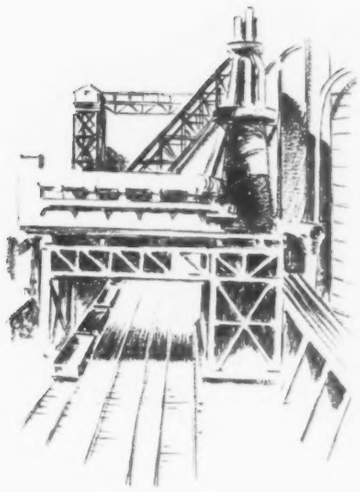
Industries dependent upon volume production to lower costs are more than likely to reduce prices during periods of greatest output, and when the demand tightens they are unable to make further price reductions, may even have to increase their prices or lose profits. Reduced output for the volume producer means higher costs. And appropriations made on a basis of too large schedules then absorb too large a share of the sale price, to the detriment of profits. Too rapid expansion, usually an outgrowth of cyclical business, leads to price cutting in an effort to overcome buyers' resistance and the producer who cannot offer increased value is bound to lose. One has only to compare corporation profits in good and in poor times to appreciate the best management.

During periods of large business activity it is possible to maintain prices at favorable levels, increasing sales only on the basis of attainable profitable volume. Capacity to produce may be kept up to the demand, but it is neither profitable nor advisable to increase capacity to keep pace with cyclical increases. This is well illustrated by the experience of a large manufacturing corporation which expanded manufacturing capacity along the lines of the purely cyclical expansion following the collapse of 1921, and planned its production schedules for 1924 on the basis of a false trend which conformed to the cycle. When business contracted and volume fell off, this corporation found itself with excess capacity, which was a severe burden on the business for over two years, and profits suffered accordingly.

It is far better for a business to adjust capacity to conform to the trend of long-time growth, confining production schedules to agree with actual business conditions. Among volume producers there is a natural disinclination to refuse any business that may be secured, but grasping for more and more volume invariably leads to overexpansion at the wrong time.

Folly of Competition Based Solely on Price

Price policies for articles of merit have an effect upon future demand because there is always present a deferred demand which comes into action at a lower price. The relation of price to subsequent demand is revealed in both the corporations cited, because in each case the product has behind it a large good-will based on value, and each lowering of the price widened the market to include a new range of buyers. A good many volume producers have made the mistake of flooding their potential market by cutting the price level down to where competition is based solely on price. It is more profitable, in the long run, to sell a fair share of the actual market, and then to seek an increasing volume on the basis of prices lowered by the operating economies secured by good management from the business done.



NEW STEEL CAPACITY OF 845,000 TONS—PIG IRON EXPANSION SMALL

AN increase in steel-making capacity of 845,000 gross tons was made by the industry last year. This time a year ago reports covered 4,690,000 tons in open-hearth steel making plants as projected for 1930. Meanwhile work is far along on additional open-hearth construction, so that fairly early in 1931 facilities will be markedly augmented, while the total of new plant for erection this year amounts to 4,180,000 tons.

The increase last year of 845,000 tons (about 1.35 per cent) may be set against an annual increase in consumption which has been running lately at about 1,375,000 tons.

A summary of important facts regarding new construction and equipment added in 1930 or planned for 1931, according to information furnished by companies having blast furnaces, steel plants and rolling mills, as well as the steel foundry industry, follows:

Open-Hearth Capacity Added in 1930

A year ago 47 open-hearth furnaces were under way for possible completion in 1930. Our reports show that 12 furnaces were built and put into operation last year having a steel-making capacity of 845,000 tons. This compares with 1,005,000 tons for 11 furnaces completed in 1929, which was the post-war record. The 845,000 tons completed in 1930 ranks fifth among the post-war years, having been exceeded in 1929, 1928, 1926 and 1923. The war peak was 4,205,000 tons in 1916 for 103 furnaces.

Additions to open-hearth capacity in 1931 were made by the following companies:

Empire Steel Corpn., Mansfield, Ohio, two 100-ton furnaces; Youngstown Sheet & Tube Co., Indiana Harbor Plant, Chicago, three 250-ton furnaces (reported a year ago); Great Lakes Steel Corpn. plant, Ecorse, Mich., of the National Steel Corpn., six 150 to 175-ton furnaces; General Steel Casting Corpn., Eddystone, Pa., three 50-ton furnaces, and Ohio Steel Foundry, Lima, Ohio, one 15-ton furnace.

Large Increases Under Way in 1931

The building of 39 open-hearth furnaces is reported as under way for 1931 and the total tonnage, estimated at 4,180,000 tons, will be the largest year in this respect since the war.

The projected expansion is reported by the following companies:

Bethlehem Steel Corpn., Lackawanna plant, six 150-ton furnaces and six 150-ton furnaces at its Maryland plant; Wisconsin Steel Co., Chicago, two 100-ton furnaces.

United States Steel Corpn. has under construction the erection of 14 furnaces at its South Chicago works and seven furnaces at the Gary works of the Illinois Steel Co. at Chicago, but the size of the furnaces is not reported. A three-furnace duplex open-hearth plant is scheduled for the National Works of the National Tube Co. at McKeesport, Pa. A new furnace is reported scheduled for erection at the Fairfield plant at Birmingham.

Rebuilding and enlarging of existing open-hearth furnaces are reported by several companies. Besides the Steel Corporation, which rebuilt four open-hearth furnaces at the Donora plant of the American Steel & Wire Co., the Republic Steel Corpn. at its Youngstown plant enlarged 11 open-hearths, and the Gulf States Steel Co., Birmingham, increased the capacity of three open-hearth units from 75 to 90 tons and reports an increase in capacity of 45,000 tons of ingots per year.

One New Blast Furnace Last Year

Only one new blast furnace was added to the country's capacity in 1930. It was a 600-ton furnace built by the Wisconsin Steel Co., Chicago, having a rated capacity of 225,000 tons of pig iron per year. The 1930 record parallels three other years since the war, when only one furnace was blown in—1921, 1924 and 1925. In two years since the war, 1923 and 1927, no new furnaces were added. The years of largest increased capacity since the war were 1920 and 1926, when six furnaces were completed each year, having a capacity of 875,000 and 1,255,000 tons respectively.

Blast Furnace Expansion in 1931

The record since the war of blast furnace additions has been: Two in 1919, six in 1920, one in 1921, two in 1922, none in 1923, one in 1924, one in 1925, six in 1926, none in 1927, two in 1928, one in 1929 and one in 1930—23 in all. For any peace year the record was nine

Additions to Open-Hearth Capacity Since the War

Year	Annual Capacity, Gross Tons	Year	Annual Capacity, Gross Tons
1920	675,000	1926	865,000
1921	247,500	1927	630,000
1922	227,500	1928	895,000
1923	875,000	1929	1,005,000
1924	375,000	1930	845,000
1925	585,000		

new stacks in 1912, with the record for the war at 14 in 1917.

Only one furnace is reported as planned for possible construction and completion this year. It is the 1000-ton furnace of the Federal Furnace Co., South Chicago, Ill., having an estimated capacity of 365,000 tons of pig iron annually.

Improvements of Existing Furnaces

Considerable increased capacity in blast furnace output is credited to the rebuilding and enlargement of existing blast furnaces, of which considerable work is reported as completed last year and under way for this year. Last year the Weirton plant of the National Steel Corpn. at Weirton, W. Va., erected an 1100-ton blast furnace in place of its 600-ton furnace and on the same site, increasing the capacity 150,000 tons per year.

The Steel Corporation rebuilt six blast furnaces at its various plants and has under way the remodeling of two other furnaces. The Republic Steel Corpn. reconstructed its blast furnace at the Warren, Ohio, plant, and the Youngstown Sheet & Tube Co. is remodeling one of its Campbell furnaces at Youngstown.

The Bethlehem Steel Corpn. at its Maryland plant built a new stack last year to replace its C furnace and at its Maryland plant it has under way the replacing of its D furnace. At its Cambria plant it replaced last year its G furnace with a new stack, and at its Lackawanna plant it is replacing its G furnace with a new one.

There has been continued increase in the capacity of electric steel ingots and castings at various plants, and the increased use of the high-frequency electric induction furnace was a feature of operations last year. There are indications that increases of this nature will be large this year, and the probable expansion in the production of rustless steel of all kinds will increase the demand for arc and induction electric furnaces. Some details of increased electric furnace expansion are given on another page.

Chief features which various companies have sent to THE IRON AGE reporting new construction and equipment completed or planned follow:

What the Steel Companies Are Doing

The Steel Corporation

NEW construction completed during 1930 and under way as of Jan. 1, 1931, by subsidiary manufacturing companies of United States Steel Corpn. is as follows:

CARNEGIE STEEL CO.

Completed

Edgar Thomson Works: Rebuilding blast furnace "D" and adding new chipping building and equipment at foundry.

Homestead Works: Extending stock yard and additions to crane equipment at No. 4 open-hearth plant.

Carrie Furnaces: Improvements to blast furnace No. 1.

Ohio Works: Increasing capacity of crane facilities at mold yard and skull cracker in open-hearth department.

Mingo Works: Two turbo blowers for blast furnaces.

Upper Union, Youngstown, Works: Increasing rolling capacity of 12-in. bar mill No. 6; central assembling and shipping buildings.

Clairton Works: Compressor station and gas line at by-product coke plant; improvements to 768 ovens at by-product coke plant; new ore bridge and transfer cars and improving ore yard.

Farrell Works: Additions to blooming and sheet bar mills; heavier pouring equipment and reinforcing crane runway at open-hearth plant.

Under Way

Edgar Thomson Works: Improvements to blast furnace "F"; 15-ton ore bridge at stock yard of blast furnaces "J" and "K."

Duquesne Works: Electrification of roughing and finishing mill drives at 22-in. mill No. 5.

Homestead Works: Additional charging equipment and improvements to pouring facilities and furnaces at No. 4 open-hearth department.

Carrie Furnaces: Improvements to blast furnace No. 2.

Schoen Steel Wheel Works: Heat-treating plant.

Mingo Works: Additions to furnace, stock trestle and bins at blast furnace No. 2.

McDonald Mills: New 10-in. bar mill, No. 17; normalizing furnace.

Clairton Works: Coal cleaning plant at by-product coke ovens.

ILLINOIS STEEL CO.

Completed

South Works: Rebuilding blast furnace No. 8; new blowing station of 3 centrifugal blowers at Bessemer department; new roll shop and consolidating roll turning facilities.

Joliet Works: Flue dust sintering plant at blast furnaces.

Gary Works: Rebuilding blast furnaces Nos. 8 and 10; 28-in. mill for rolling strip steel.

Under Way

South Works: Six gas-driven blowing engine units to modernize and improve blowing facilities at blast furnaces Nos. 1 to 10 and "E"; 14-furnace open-hearth plant; 44-in. blooming and slabbing mill; wide flange beam mill; 96-in. continuous plate mill; 10-in. alloy bar mill; flue dust sintering plant and facilities for flue dust recovery.

Gary Works: Enlarging blast furnace ore yard; 7-furnace open-hearth plant; 44-in. slabbing and blooming mill; two additional batteries of 69

Increase in Open-Hearth Furnaces and Capacity in Gross Tons

	Furnaces	Capacity
Completed in 1930:		
Independent companies	12	845,000
United States Steel Corporation	--	--
Total	12	845,000
Under way for 1931:		
Independent companies	14	1,200,000
United States Steel Corporation	25	2,980,000
Total	39	4,180,000

ovens each at by-product coke plant; flue dust sintering plant.

UNIVERSAL ATLAS CEMENT CO.

Under Way

Buffington Works: Rebuilding waste heat boilers and dust collectors at mill No. 6; a warehouse was completed at Homestead, Pa., and a distributing station is being constructed at Milwaukee, Wis.

CANADIAN STEEL CORPORATION, LTD.

Completed

Ojibway Works: Plant for galvanizing sheets and tinning black plate.

NATIONAL TUBE CO.

Completed

National Works: Buildings and equipment to manufacture electric arc welded pipe 14 to 30 in. o.d. inclusive, in 40-ft. lengths.

Lorain Works: Improvements to blast furnace No. 1 and four hot blast stoves; new seamless mill No. 3, replacing lap weld mill No. 6.

Gary Works: Additional equipment in No. 1 seamless mill for manufacture of pipe 13 to 24 in. o.d.

Under Way

National Works: Three-furnace duplex open-hearth plant and auxiliaries, changes and additions to blooming and slabbing mills, including new 32-in. reversing bar mill and Nos. 1 and 2 seamless pipe mills.

Ellwood Works: New drawing and annealing equipment to modernize cold drawing department.

Gary Works: New No. 2 seamless mill for tubular goods ranging from 3½ to 8⅝ in. o.d., in lengths up to 45 ft.

AMERICAN STEEL & WIRE CO.

Completed

Central Furnaces: Modernizing blowing facilities of two blast furnaces.

Consolidated Works: New cleaning and baking equipment.

Fairfield, Ala., Works: Equipping furnaces to use natural gas as fuel.

Donora Steel Works: Rebuilding four open-hearth furnaces.

Donora Zinc Works: Additional ore roasting equipment; equipment for recovery of allied metals from zinc ores and for treatment of galvanizing by-products.

Under Way

Central Furnaces: Improvements to blast furnace "C" and enlarging four hot blast stoves.

Cuyahoga Works: Additional facilities for manufacture of cold rolled strip steel.

Donora Steel Works: New stock bins and improvements to ore handling system at blast furnaces; new billet mill and two rod mills.

AMERICAN SHEET & TIN PLATE CO.

Completed

Vandergrift Works: Two gas-fired normalizing furnaces; improvements in annealing, cold rolling and hot mill departments and warehouse facilities.

Wood Works: Additional pickling and heat-treating facilities for finishing chromium alloy steel sheets.

Mercer Works: Changes to hot mill pickling, annealing, cold rolling and finishing departments to roll and finish 72-in. wide material.

Farrell Works: Rebuilding tin house and rearranging equipment.

Under Way

Gary Tin Works: Additional finishing and handling facilities for strip steel at continuous mill.

National Works: Reconstructing tin house and installing additional double tinning units.

Gary Sheet Works: Two continuous pack furnaces.

Vandergrift Works: Additional box annealing furnaces and four mechanical gas producers.

AMERICAN BRIDGE CO.

Completed

Ambridge Works: Shop building and equipment for fabricating C. B. column sections; new fabricating shop for beams and channels.

CANADIAN BRIDGE CO., LTD.

Completed

Walkerville Works: New tower plant.

TENNESSEE COAL, IRON & RAILROAD CO.

Completed

Ensley Works: Improving blast furnace No. 2 and installing additional hot blast stove; rebuilding ladle cranes in open-hearth department; extension to fertilizer plant.

Fairfield Works: Improvements to blast furnaces Nos. 5 and 6 and power station; continuous reheating furnace and building at combination bar and structural mill; extension of water reclaiming system; new warehouse and extension to finishing department of sheet mill.

Under Way

Ensley Works: Additional blower and improvements at No. 1 turbo blower station.

Fairfield Works: New open-hearth furnace No. 9; additional soaking pit and improved shipping facilities at 45-in. blooming mill; new 42-in. universal plate and strip mill; extension of sheet mills.

Bethlehem Steel Corporation

SUBSIDIARY companies of the Bethlehem Steel Corpn. report the following principal improvements and additions completed in 1930 and under way at the close of the year:

COMPLETED

Bethlehem Plant, Bethlehem, Pa.: Six-story addition to general office building; Dwight-Lloyd type sintering plant; one Bethlehem gas-driven twin blowing engine; gas cleaning equipment for blast furnace gas; improvements and additions to cold drawing department; addition and extension to Nos. 1 and 2 structural fabricating shops.

Steelton Plant, Steelton, Pa.: Motorizing 26-in. bar mill; extension to structural fabricating shop.

Lebanon Plant, Lebanon, Pa.: Extension to forge shop including complete new equipment for manufacture of sucker rods; 160-ft. extension to galvanizing plant; additions to central steam generating plant.

Maryland Plant, Sparrows Point, Md.: Battery of 61 Koppers coke ovens replacing former No. 2 battery; new stock replacing former "C" blast furnace stack; two Bethlehem gas-driven blowing engines, including gas washer and extension to gas engine building; four additional hot sheet mills and auxiliaries.

Lackawanna Plant, Lackawanna, N. Y.: Four additional waste heat boilers at open-hearth No. 1; additional gas producer for nut coke at coke ovens; three Bethlehem gas-driven blowing engines with gas cleaning equipment; central coke screening station for blast furnaces; improved gas burners and temperature controls for stoves of blast furnaces; continuous bloom, sheet bar and billet mill including buildings and auxiliaries.

Cambria Plant, Johnstown, Pa.: Central coke screening station; one battery of 77 Koppers coke ovens including coke bin, coke wharf and quenching station at Franklin division; two turbo blowers for "G," "H" and "J" blast furnaces; gas cleaning equipment for three blast furnaces at Franklin division; two steam generators for blast furnaces at Franklin division and two for blast furnaces at



Lower division; new stack to replace former "G" blast furnace at Franklin division; equipment and improvements, including new ladle cranes for open-hearth department, Franklin division; six 4-hole soaking pit furnaces including building and cranes for 48-in. blooming mill, Lower division; rail anchor plant and Keystone tie plant at Gautier division.

UNDER WAY

Bethlehem Plant, Bethlehem, Pa.: One Bethlehem gas-driven twin blowing engine; new ladle cranes, ladles and runways for No. 2 open-hearth department; gas producers and apparatus for recovery of cyanogen at coke ovens.

Steelton Plant, Steelton, Pa.: Installation of improved machinery and equipment at frog and switch department.

Maryland Plant, Sparrows Point, Md.: Overhead viaduct for electric passenger cars; new central dispensary; gas cleaning and distribution system for blast furnace gas; two steam generators including boiler house at blast furnace department; new turbo blower for blast furnace including pump house, pumps, steam and water mains, crane, etc.; new blast furnace "D" replacing present "D" furnace; three gas disintegrators, moisture eliminator and mains, etc., for cleaning blast furnace gas; new open-hearth department No. 3 consisting of six furnaces with building and equipment; gas main for blast furnace gas to blooming mills; new 40-in. universal slabbing mill including eight soaking pits with necessary buildings and other equipment; automatic squaring shear and scrap baler at sheet mills.

Lackawanna Plant, Lackawanna, N. Y.: Two-bay extension to No. 2 power house including two steam generators equipped for pulverized coal and blast furnace gas; three 5,000-kva. transformers at No. 3 sub-station; complete rebuilding of by-product department at coke ovens, including extension to benzol department; cleaning equipment and distributing system for use of blast furnace gas at open-hearths and mills; gas washers at three blast furnaces; three center dump ore transfer cars; new stack to replace present "G" blast furnace stack; shear, shear tables and crane at structural shipping yards.

Cambria Plant, Johnstown, Pa.: Gas cleaning equipment for two blast furnaces at Lower division and for two at Franklin division; ore bins, coke screening station, three scale cars for blast furnaces "E" and "F."

Pacific Coast Steel Corporation.

Completed

South San Francisco Plant, South San Francisco, Cal.: Acquisition of site for warehouse; machinery and equipment for bolt and nut department.

Los Angeles Plant, Los Angeles, Cal.: New reinforcing bar department including buildings and equipment; equipment for bolt and nut department.

Under Way

Los Angeles Plant, Los Angeles, Cal.: Acquisition of site and erection of warehouse.

Seattle Plant, Seattle, Wash.: Additions to 22-in. and 16-in.-12-in. mill and bending department buildings.

Youngstown Sheet & Tube Co.

THE Youngstown Sheet & Tube Co., Youngstown, completed during the year 1930, at its various plants, the following construction work:

CAMPBELL WORKS

Coke Plant: Additions and alterations to by-product, including primary cooling equipment, exhausters, final coolers, cooling tower, etc.; bag and plaster paris storage leanto with necessary handling equipment; vacuum sweeping system installed in coal handling building and a new fire station with equipment.

Blast Furnaces: Remodeling No. 3 furnace by enlarging and altering top, building new dust catcher and whirler, new stock line recorder, heat control for stoves, cinder notch stopper, tapping machine, mud gun and new 5-ton slag crane; installation of larger dust catcher and whirler at No. 1 furnace; three new scale cars put in operation for furnaces Nos. 2, 3 and 4; new trolley for No. 1 ore bridge.

Open-Hearth Department: Electrifying doors and valves on 12 furnaces; new slag and checker chambers and installation of an automatic combustion control and regulator for No. 10 furnace; extension to bottom pouring floor including addition to building, 10-ton ingot stripping crane, molds, etc.; rebuilding ladles to 125-ton capacity; new fluorspar and burnt lime bins.

Seamless Tube Mills: Installation of a straightening machine and additional cooling rack capacity at No. 12 mill; two barrel type reeling machines, alterations to inlet table, billet chipping machine with monorail system for handling billets, installation of a piercer point furnace for normalizing piercer points, and an automatic oil spraying machine at the No. 14 mill.

Power and Blowing Engine Houses: Installation of an additional 18,000-k.v.a. turbo generator with necessary condenser equipment, etc., at No. 5 power house; a continuous blow-down system for evaporators at No. 2 blowing engine house.

INDIANA HARBOR WORKS

Coke Plant: Extension to benzol plant, and additional light oil scrubbing capacity.

Blast Furnaces: A second 15-ton ore bridge, and changes to drive on No. 1 bridge; at No. 1 furnace: raising skip incline 4 ft., bell tower, pyrometers above mantle, automatic stock line recorder and bell operating mechanism, cinder notch stopper, individual fans and motors installed on gas burners; wash and locker room at sintering plant.

Open-Hearth Department: Extension to building, three new 250-ton furnaces with waste heat boilers, charging floor crane, two steel ladle cranes, floor charger, scrap yard crane, molds, rolling stock, etc.; extension to stripper building and stripper crane; extension to scrap yard runway.

Blooming Mill: Modification of drive, including new and larger fly wheel motor generator set, auxiliary equipment and necessary motor changes; two additional 4-hole soaking pits; new crane girders on No. 2 pit crane.

Billet Mill: A continuous 10-stand billet mill to replace the single-stand 28-in. mill. This 10-stand mill is electric driven, and is complete with cooling beds.

Merchant and Rod Mills: A new 10-in. merchant and rod mill, consisting of five roughing stands driven by a single motor, four intermittent roughing stands driven by a single motor, three intermittent finishing looping stands individually motor driven, and five finishing stands driven by a single motor. These 17 stands have nominal roll diameters of 14 in., 12 in. and 10 in. Bars may be delivered either to the cooling bed or to the reels. Billets are heated in a producer fired continuous furnace.

A new 14-in. and 18-in. merchant mill, consisting of two stands of 24 in., three stands of 22 in., three stands of 18 in., two stands of 14 in., all driven by a single motor, and two stands of 14 in. individually driven. The mill has two outlets, one from the last 18-in. stand, and one from the last 14-in. stand, each delivering to its own cooling bed. Billets are heated in two producer fired furnaces.

The combined capacity of the mills is 360,000 tons of bars per year.

Tube Mills: One complete electric weld tube mill for the manufacture of electric welded pipe 16 to 26 in. o.d. This mill is connected with the large plate mills at the Brier Hill Works, the skelp being delivered from these mills to it in curved form, and ready for welding; one pair automatic threading machines on No. 2 floor; one automatic power saw for die shop.

General: 241-ft. concrete cap dock, south extension; air filters on main drive motors in steel plant; office building extension; rolling stock addition of two 30-ton dump cars.

BRIER HILL WORKS

Blast Furnaces: Installation of automatic hot blast control and recording dials for two scale cars at Grace furnace.

Open-Hearth Department: An additional ingot jarring machine; new surplus coke gas line, by running branch lines from coke gas mains to producer mains; narrow gage scale and track changes.

Blooming Mill: Replacing stacks on four pit furnaces.

Sheet Mills: Changing box annealing furnaces Nos. 21, 22 and 23 from coal to gas-fired; revamping and rebuilding No. 24 box annealing furnace; installing one pair and one pack furnace.

General: Automatic draft control on one boiler at Grace furnace; additional machine tools for shops; lime storage and feeder system at pump house.

STRUTHERS WORKS

Merchant Mills: New angle straightening machine; two heavy duty roll lathes.

SOUTH CHICAGO WORKS

Coke plant: Coke screening plant; new clay grinding machine.

Blast Furnaces: At No. 3 furnace —new automatic stock line recorder, steam mud gun, and dry gas cleaning system with whirler; at No. 5 furnace —dry gas cleaning system with whirler.

EVANSTON WORKS

New conduit electro galvanizing department; changes to conduit building; additional tools in cut pipe department.

Republic Steel Corporation

THE Republic Steel Corpn. has completed the following construction work at its various plants during 1930:

YOUNGSTOWN DISTRICT

Eleven open-hearth furnaces have been enlarged to increase production. The pouring side of the open-hearth building has been rebuilt and three new 275-ton ladle cranes installed. One 400-ton track scale for general yard service has been installed. At the Bessemer plant, the mixer building has been remodeled and mixer crane reconstructed. Three new continuous heating furnaces with furnace tables have been constructed for the 84-in. plate mill. The finishing end of this mill has also been remodeled to enable handling plates up to 50 ft. long.

The three electric welded pipe mills having a range of pipe sizes from 2 to 16 in. have been completed, and put into operation. The threading department in the butt and lap weld pipe mills has been rearranged and electric welding equipment for end welding pipes from 1½ to 4 in. installed.

WARREN DISTRICT

The blast furnace has been rebuilt and enlarged; also the new turboblower, disintegrator, and a 125-ton mixer type ladle and car have been installed. At the open-hearth stockhouse a new ore and stone bin system has been installed. An air ventilating system with filters has been installed at the blooming mill motor room; also a new 10-ton pit crane has been installed at the blooming mill pit furnaces.

At the hot strip mills, three continuous heating furnaces, one additional gas producer, hydraulic pump for mill water, 15-ton overhead crane and air ventilating system with filter for motor room have been added. Also No. 1 hot strip mill building has been extended and a new two-high roll stand installed at No. 2 strip mill.

At the cold strip department a new roll grinder, 6-box annealing furnaces, and two breaker machines with reels have been added. At the sheet and tin department a new lacquering oven, one sheet and pair furnace, tractor system for tin house and 14 tin shear hand-overs, have been installed.

Three 3333-kva. transformers and a 200-ton yard track scale have also been installed at Warren and a 200-ton track scale has been installed at the Niles plant.

CENTRAL ALLOY DISTRICT

At the Massillon plant, the sheet mills have been rearranged and the double mill system installed which included the construction of eight new pair furnaces and five pack furnaces. Rolling, grinding, polishing and processing equipment has been added in the stainless steel department in order to increase production.

At the Canton plant a new 25-ton Heroult electric furnace, with all auxiliary electrical equipment, has been installed. A building with necessary equipment and tools has been installed for the manufacture of corrugated culverts.

A 30 by 16 by 58 in., 3-high sheet mill complete with a 120-in. by 45-ft. long walking beam type heating furnace and a 36-in. by 14-ft. roll grinder were also installed at the Canton plant.

CHICAGO DISTRICT

A 10-in. combination merchant bar and rod mill complete with all necessary buildings, furnaces, electrical equipment, auxiliary tools and finishing equipment, has been completed and put into operation. A new ingot transfer car at the pit furnaces, an 8,000,000-gal. centrifugal water pump and a new cut-off machine at the 21-in. mill has been installed.

Also a new metallurgical laboratory, carpenter shop, pipe shop and addition to main office have been completed.

BUFFALO DISTRICT

A new ingot stripper runway has been installed, and a new 150-ton inverted stripper installed. An additional 50-ton annealing furnace for the die rolling department has been constructed and a 120-ft. extension to the die rolling finishing building has been made.

John A. Roebling's Sons Co.

John A. Roebling's Sons Co., at its Kinkora Plant, Roebling, N. J., completed and put into operation during 1930:

A copper wire mill equipped with drawing, tinning, annealing and stranding equipment.

The electrification of all wire mills was completed together with the installation of additional substation equipment to bring the total capacity to 15,000 k.w.

At the Trenton Plant, Trenton, N. J., the entire reconstruction of rope shop No. 1 and an extension to rope shop No. 2 were completed with addition and rearrangement of equipment to improve manufacturing efficiency.

A fireproof three-story research laboratory has been under construction and will be fully equipped and in service early in 1931. Its investigations will cover steel, wire, wire rope and other products of steel wire, also copper wire, insulated wire and lead sheathed cables.

Carpenter Steel Co.

Carpenter Steel Co., Reading, Pa., last year installed its second Ajax high-frequency electric furnace having a daily capacity of 24,000 lb.

A new generator building was erected last year together with the installation of two 1000-kw. generators driven by two 1440-hp. motors, 2200-volt, alternating current, with a constant speed of 720 r.p.m.

A cold-rolling strip mill was installed having one 4½-in. by 9¾-in. by 8-in. cluster.

Gulf States Steel Co.

GULF States Steel Co., Birmingham, Ala., gives the following information regarding new mills which have been completed:

Blooming Mill: New 40-in. blooming mill placed in operation March 17, 1930. This mill was built by the United Engineering & Foundry Co. of Pittsburgh. Steel used throughout including roller tables and manipulators. In design is equal in strength to a 44-in. mill.

Extensions of billet yards were made to furnish billets to old and new units.

Also completed two rows of 64 in. x 14 ft. soaking pits, four holes each and each hole having capacity for ten 18-in. x 20-in. ingots, giving a total additional pit capacity of 80 ingots. These new pits are equipped with Isley furnace control and were designed by the James Criswell Co. of Pittsburgh.

Plate Mill: New 32-in. universal plate mill was placed in operation on July 26, 1930. This mill was built by the Mackintosh-Hemphill Co. of Pittsburgh, and has an initial capacity of 20,000 tons monthly. The top and bottom rolls are 32 in. in diameter by 90 in. long, and the middle roll is 22 in. in diameter by 90 in. long. The mill is served by two end charged, side discharged furnaces designed by the James Criswell Co. It is operated by an automatic screwdown controlling rolling to thickness, being the first application of this principle to a plate mill rolling steel.

Main motor is 4000 h.p., d.c., driven by a motor generator set with flywheel, being the first application of a direct connected blooming mill type d.c. motor to a 3-high plate mill. Length of hot bed 72 ft. Two plate shears were installed, motor driven, one to cut plates to length and the other for shearing to width.

Sheet Mills: These consist of the following units: Three 2-high mills, three 3-high mills and one 3-high jobbing mill; initial capacity 9,000 tons monthly; electrically driven throughout.

Open-Hearths: Three furnaces rebuilt and rated capacity increased from 75 to 90 tons. Steel making capacity increased from 280,000 gross tons annually to approximately 325,000 tons.

National Steel Corporation

DURING 1930, the National Steel Corpn. has brought into operation many important units, chief of which are the Great Lakes Steel Corpn.'s plant at Ecorse, Mich., and additions to the blast furnace, coke oven and rolling mill capacities of the Weirton Steel Co., Weirton, W. Va.:

Great Lakes Steel Corporation

Operations were started at the Great Lakes Steel Corporation about the first of September, 1930. This plant comprises six 175-ton open-hearth furnaces, with 16 x 48 ft. hearths these furnaces being oil-fired.

A 10-in. merchant mill is also under construction and will be ready for operation about July 1. This mill comprises 14 stands and will roll rounds and squares from 5/16 in. to ½ in., flats up to 4 in., angles up to 2 in., and other merchant mill sections.

Completion of these units will round out the plant for supplying the majority of sections required in the automobile industry and for other uses in the Detroit district.

Weirton Steel Co.

During 1930, the Weirton Steel Co. has made some important additions to

its plants at Weirton and Clarksburg. On Jan. 1, 1930, the old No. 1 blast furnace of 600-ton capacity, built during the war, was dismantled and a new 1100-ton furnace erected in its place.

In order to supply coke for the additional pig iron production, a battery of 25 Becker type ovens was added at the coke plant, making a total of 111 ovens at the plant.

Due to the growth of the finishing mill departments throughout the plant it was decided to utilize the maximum amount of by-product coke oven gas in the finishing mill departments and two 30,000 cu. ft. disintegrator gas washers were installed at the blast furnace department for cleaning blast furnace gas and a main constructed from the blast furnaces to the coke ovens to deliver blast furnace gas for underfiring the coke ovens instead of using coke oven gas, thereby releasing the entire surplus from No. 2 and No. 3 batteries for use in the finishing departments of the plant.

Early in 1930 it was decided, in order to secure a wider diversification of products and utilize a surplus of steel production, to build a 28-in. rail and structural mill.

This mill will produce rails, tie plates, splice bars, "I" beams and channels up to 15 in., angles up to 8 x 8 in., squares and rounds up to 6 in. and 7 in., flats up to 24 in. and other usual structural or merchant sections. At the beginning of operations this mill will have a production of 15,000 to 18,000 tons per month of structural shapes, squares, rounds, flats and splice bars. It started operation Dec. 29, 1930.

At the Clarksburg plant of the company, work is in progress to install electric drives on all of the hot mills and cold mills, comprising one 1500-hp. unit, one 750-hp. unit for the hot mills and one 500-hp. unit for the cold mills, to replace the existing steam engine drives so that the plant will be operated on purchased power. This work will be finished about March 1, this year.

The additional productive capacity of these various additions to the National Steel Corporation is as follows:

At the Great Lakes Steel Corporation, ingot capacity 600,000 tons per year, this being limited by the present capacity of six open-hearth furnaces which will eventually be built to a 12 or 14 furnace unit; billet capacity of 350,000 tons per year; sheet bar, 280,000 tons per year; strip steel, 360,000 tons per year; 14-in. merchant mill, production, 220,000 tons per year; 10-in. merchant mill production, 110,000 tons per year.

At Weirton, the rebuilding of No. 1 blast furnace provided the additional capacity of 150,000 tons of pig iron per year, the additions to the coke plant, an additional 150,000 tons of coke per year and of by-products, 2600 tons of ammonia sulphate, 2,500,000 gal. of tar and 60,000 gal. of benzol pure products.

The construction of the 28-in. rail and structural mill will have a productive capacity at the beginning of 180,000 to 200,000 tons per year of structural shapes and merchant sections to be followed later in the year with the production of rails.

Jones & Laughlin Steel Corporation

Jones & Laughlin Steel Corporation, at its Pittsburgh works, now has under construction two turboblowers for the converting department, a new merchant bar mill to replace existing mill to be dismantled, and alterations and expansions to existing merchant bar mills.

At Aliquippa, Pa., works, a seamless coupling shop is being constructed, and alterations and expansions are being made to the seamless tube mills.

The river fleet was augmented during the year by the launching of two propeller type boats, and two additional similar units are now under construction for launching early in the year.

An extensive addition is being made to the company's Chicago warehouse, and a plot of ground has been purchased adjacent to the Memphis, Tenn., warehouse for future expansion.

In Minnesota, plant and equipment are being installed to operate the Hill Annex Iron Mine, heretofore operated under contract.

Central Iron & Steel Co.

Central Iron & Steel Co., Harrisburg, Pa., last year installed a 150-b.hp. fire tube waste heat boiler on one ingot heating furnace; one 300-ton hydraulic press for the flanging department; one washer press for manufacturing heavy steel washers, and 950 ft. of 10-in. diameter steam line connecting two boiler houses.

Improvements under way include one 500-b.hp. fire tube waste heat boiler on one open-hearth furnace; one complete set of Blaw-Knox patented water-cooled valves for an open-hearth furnace, one 49-in. by 2-in. plate shear installation in the universal mill and alterations to the 42-in. universal mill for rolling large forging billets.

Wisconsin Steel Co.

Wisconsin Steel Co., Chicago, completed last year the installation of 45 Koppers by-product coke ovens having a daily rated capacity of 550 net tons of coke. At blast furnace No. 1 there was completed an electrical skip fill having a daily rated capacity of 750 gross tons.

There is under construction for completion in 1931 a No. 2 open-hearth furnace of 200 gross tons capacity.

Early last year the company's new 600-ton blast furnace was blown in.

Otis Steel Co.

Otis Steel Co., Cleveland, will erect a continuous 72-in. sheet mill at its Riverside plant during the present year. A reheating furnace and other auxiliary equipment will be installed. An extension to the blooming and bar mill building will be erected to provide space for the new mill. The contract for the mill has been placed with the United Engineering & Foundry Co.

Empire Steel Corporation

Empire Steel Corporation, Mansfield, early last year completed two 110-ton open-hearth furnaces which were started during the previous year.

Granite City Steel Co.

Granite City Steel Co., Granite City, Ill., completed in 1930 the installation of one Surface Combustion Co. pair furnace which supplies two rolling mills; a complementary pack furnace, which supplies one finishing mill; a new galvanizing plant with complementary equipment, and one 100,000-lb. steam generator.

Alan Wood Steel Co.

Alan Wood Steel Co., Conshohocken, Pa., last year put in operation a new sintering plant at its blast furnace department having a capacity of 600,000 lb. per year. Construction of this was commenced in 1929 but not completed until last year.

The company's subsidiary, the Alan Wood Mining Co., completed last year the reconstruction of the concentrating mills and the opening and development of its iron ore mines in northern New Jersey. Shipments of concentrates were started from the Washington Mine, Oxford, N. J., last June, and from the Scrub Oaks Mine, Dover, N. J., last November. No new capacity is planned or under way for construction this year.

Calumet Steel Co.

The plant of Calumet Steel Co., Chicago Heights, Ill., was closed down about Dec. 1, and will not resume operations until Jan. 15, during which time a new 18-in. stand will be put in place and a 2000-hp. motor will be installed to take the place of a 1000-hp. motor which will be moved over to take the place of a 400-hp. motor, the 400-hp. motor to be taken permanently out of service.

Corrigan, McKinney Steel Co.

Corrigan, McKinney Steel Co., Cleveland, erected a 32-in. blooming mill during the year. This was a standard reversing type mill built by the Mesta Machine Co. A Chapman-Stein soaking pit furnace was also added. A 4000-hp. reversing motor and flywheel motor generator set consisting of two 1600-kw. generators were installed to drive the new mill.

Canton Tin Plate Corporation

Canton Tin Plate Corpn., Canton, Ohio, which was formed during the year, took over the plant formerly operated by the Carnahan Tin Plate & Sheet Co. and later by the Falcon Tin Plate Co. and remodeled the plant to produce tin plate and black tin mill specialties. Present equipment includes eight tin mills driven by a Westinghouse 1200-hp. motor and a Falk double reduction gear unit, 10 electrically-driven cold mills, annealing ovens, pickling machines and four Davis type tin coating machines.

Apollo Steel Co.

Apollo Steel Co., Apollo, Pa., during 1930, provided additional capacity for the rolling of high-finished sheets to the extent of about 40,000 tons annually. Heating, normalizing and rolling machinery was added, and the company is now equipped to manufac-

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Copper Has Improved Its Economic Position

(*Concluded from page 87*)

adverse conditions in most of our markets, inability to make operative sooner the curtailment program, and the depletion of stocks and inventory by consumers. The stock of blister copper decreased 43,875 tons; and the stock of 224,531 tons at Nov. 30 is no greater than is required for the operation of the refineries.

Prices ranged from the 18c. level, at which it had been stabilized for an entire year and from which it broke in April, to the low point of 9½c. in October. From that low point it advanced to 12c., but too rapidly and for well-known reasons.

Inability of custom smelters to balance their intake with sales at 12c. soon forced the price to 10c. The larger producers, having sold freely, refrained from participation in the foreign market and, at the time of writing, renewed buying from that quarter is providing more business than custom smelters are prepared to accept.

Copper at 10c. is apparently the level at which clients of custom smelters are willing to withdraw or carry copper in stock.

The effect of low prices and curtailed production is graphically portrayed by the record of diminishing dividends or a complete cessation of the same. Companies controlling their production from mine to consumer are in the most favorable position for maintaining an earning power that justifies continued dividend disbursements.

Fair Demand for Copper Expected

The copper industry, as all others, must await the long deferred revival of business, but, with production balancing the needs of the fabricators, its house is in order. It enters 1931 with unfilled orders equaling three months' production and an unfilled foreign demand of 125,000 tons for the first quarter.

While many of our fabricators took advantage of the opportunity to replace their working stocks at the low price level that prevailed, they also reduced their inventories and are practically bare of unsold copper stocks, as are their customers and distributers of fabricated articles.

Normal growth and replacement needs will inevitably provide increasing business. Many of the widely heralded major projects planned for 1930 were delayed and their completion may be anticipated in 1931.

Automobile manufacturers are more hopeful, and railroad companies must replace and modernize their equipment to compete with other means of transportation. Suburban divisions must hasten electrification to provide more frequent and speedy service.

The generation and transmission of electrical power for industrial and home uses, and the popularization of electrical equipment will continue to provide the largest demand for the products of the copper mines.

The search for new or increased uses for copper continues, and new methods of marketing must be found to provide fabricated copper products for the ultimate consumer at more reasonable prices.

Hopes are high for a stabilized price that will insure profitable operation of the mines and a demand that will outrun the present rate of production.

Shipbuilding Has Undergone Substantial Revival

(*Concluded from page 29*)

of aid to the shipyards during the next year or two. The administration's program for the fiscal year beginning July 31, 1931, calls for the construction of four submarines, 10 destroyers, one airplane carrier, one destroyer leader, one 10,000-ton cruiser with experimental flying-off deck for airplanes and one 6-in. gun experimental cruiser. Of the 8-in. gun scout cruisers authorized by act of Feb. 13, 1929, only one can be contracted for prior to 1933. Under this act the ship can be started in 1931 and built either in a navy yard or private shipyard. Contracts for the submarines, destroyers and possibly the destroyer leader will be let in 1931.

Coast Guard work, for which $2,210,000 has been appropriated, will include five to seven patrol boats, 10 to 15 picket boats and a tug for Lake Michigan, all of which may be constructed this year.

Shipping Board Urges Further Aid for Merchant Marine

FURTHER aid for shipbuilding and the upbuilding of the American merchant marine will be sought of Congress, but if there is no extra session action will be deferred in all probability until the next regular session starting in December, 1931. The United States Shipping Board has recommended readjustment of shipping laws to meet conditions that American ships are facing.

One outstanding recommendation asks for aid for American cargo ships not benefited by mail contracts in order to lower the operating differential which now handicaps these vessels in competing with those flying foreign flags. Other recommendations include revision of rates of mail compensation authorized under the Merchant Marine Act of 1928 to provide higher pay for ships operating in excess of 24 knots; that a law be enacted to award mail contracts to purchasers of Shipping Board ships; tax exemption for American vessels operating in foreign trade, including a provision whereby deductions shall be allowed from taxable income derived from operating profits to the extent that such profits are devoted to new ship construction in American yards, and the transfer to privately-owned American shipping interests of the peace-time business now handled by Navy and Army transports and by the ships owned and chartered by the Panama Railroad Steamship Line.

It is further urged that the limitation of $150,000,000 on the amount of construction loans should be removed and that the Shipping Board should be authorized to make loans up to the ultimate amount of $250,000,000. At the close of the fiscal year June 30, 1930, the Shipping Board had authorized loans to 22 steamship companies for the construction of 49 new ships and the conversion or improvement of 13. These authorized loans totaled $114,564,715, of which $43,050,890 was advanced before June 30. Since that date the total amount of loans authorized has been increased to $131,793,003.

Proponents of a strong merchant marine have as an ultimate goal the development of American flag shipping to the point where it will be sufficient to carry the greater portion of our commerce and serve as a naval or military auxiliary in time of war or national emergency.

3 Billion Dollars May Be Spent for Roads in 1931

(*Concluded from page 25*)

come is applied to roads and enables many States to participate in the Federal highway program. The appropriation for 1931 is already being spent by the State highway departments and the funds for 1932 may be made available in advance by Congressional action. Advancing the funds for 1932 would add further to the 1931 highway construction program.

There are many bills before Congress proposing different plans for highway construction. Some of them are considered to be visionary and have no chance of serious consideration. Others, including plans for superhighways, it is believed, may be acted upon at some later time, as the feeling prevails that superhighway projects should be passed by for the present in favor of the more immediate and greater requirements for building up existing main highways to be tied in systematically with secondary systems.

One bill which provides for the advancing of Federal funds to the States with which to match Federal aid dollar for dollar appears to be in considerable favor. The national treasury would accept long term low interest-bearing notes from the States.

Modern Highways Begun 28 Years Ago

THE building up of modern highways as they are now constructed started about 28 years ago. It has been during that period that committees of outstanding highway leaders in State, city and county work have studied the major problems of the industry and prepared reports. These reports form the basis of the annual convention program of the American Road Builders' Association, a nation-wide organization of all interests in the field of highway work. Founded not for profit but for educational and scientific purposes, this association, like the Bureau of Public Roads of the Department of Agriculture, has been a great factor in the continued progress of road improvements. The association's 1931 convention, Jan. 10-16, in St. Louis, is expected to attract some 30,000 road builders, manufacturers and others to hear reports which will cover a broad range of subjects. They will deal with highway finance, location, equipment, low cost roads and bridges, grade crossing elimination, subgrades and pavement bases, airport drainage and surfacing, grading methods, planning, design, etc.

The convention's work is looked to as being an important factor in pushing the gigantic 1931 highway construction program.

Proposed Expenditures of States on State Highways in 1931

(This does not include any appropriations that will be created by the 44 legislatures which meet in January)

ALABAMA* $15,900,000	KANSAS* $13,700,000	NEW HAMPSHIRE $5,500,000	SOUTH CAROLINA $22,500,000
ARIZONA $6,500,000	KENTUCKY $20,000,000	NEW JERSEY $36,000,000	SOUTH DAKOTA $6,000,000
ARKANSAS $15,000,000	LOUISIANA $30,000,000	NEW MEXICO* $5,650,000	TENNESSEE $12,000,000
CALIFORNIA $30,000,000	MAINE $13,100,000	NEW YORK $60,000,000	TEXAS $45,200,000
COLORADO $5,000,000	MARYLAND $11,000,000	NORTH CAROLINA $11,000,000	UTAH $4,000,000
CONNECTICUT $12,600,000	MASSACHUSETTS $20,000,000	NORTH DAKOTA $3,500,000	VERMONT $5,100,000
DELAWARE $2,200,000	MICHIGAN $30,000,000	OHIO $34,000,000	VIRGINIA $17,000,000
FLORIDA $12,000,000	MINNESOTA $15,000,000	OKLAHOMA $16,000,000	WASHINGTON $12,500,000
GEORGIA $18,000,000	MISSISSIPPI $6,100,000	OREGON $10,000,000	WEST VIRGINIA $14,400,000
IDAHO $5,500,000	MISSOURI $33,500,000	PENNSYLVANIA $60,000,000	WISCONSIN $33,000,000
ILLINOIS $31,600,000	MONTANA $4,500,000	RHODE ISLAND $4,300,000	WYOMING $5,000,000
INDIANA $24,000,000	NEBRASKA $10,000,000		
IOWA $30,000,000	NEVADA $3,000,000		

Proposed State highway expenditure	$840,850,000
†Federal aid	205,000,000
Estimated city expenditure	875,000,000
Estimated county expenditure	660,000,000
	$2,580,850,000

*No estimate returned by State highway department. Figure used based on 1930 expenditure.

†Includes $80,000,000 for highway construction carried in $116,000,000 emergency appropriation act signed by President Hoover Dec. 20, 1930. This entire fund has been made immediately available. Congress has under consideration additional Federal aid for State highways.

Gains in Air Travel

(*Concluded from page 17*)

3,468,562 lb. during the first six months of 1929. The mail poundage figure for January-June, 1930, included 3,571,956 lb. of domestic air mail and 189,420 lb. of foreign air mail.

Air express increased from 976,219 lb. carried in the first half of 1929 to 1,145,477 lb. in the first half of 1930. Most of the express was carried on the domestic lines, which flew with 1,142,458 lb. The foreign lines contributed 3019 lb. to the total.

Air Mileage Also Increasing

THE total miles flown by scheduled air transport planes for the 1930 period was 16,902,728, of which 14,595,915 was on domestic lines and 2,306,813 on foreign lines. In the like period of 1929, the miles flown were 9,201,338.

Aircraft engaged in miscellaneous flying, which includes such operations as experimental, exhibition, industrial, student instruction and pleasure flying, as distinguished from operations on scheduled airlines, flew 51,767,200 miles in the first six months of 1930. This was an increase of 4,767,200 miles over the corresponding period in 1929.

As aircraft engaged in sched-

uled operations flew 16,902,728 miles in the first half of 1930, the total number of miles flown by American aircraft of all types of operations was 68,669,928.

The total number of passengers carried for hire by miscellaneous operators was 716,400 from January to June, 1930. Passengers making pleasure flights, for which no fare was paid, numbered 208,400, making the total number of passengers carried in miscellaneous operations 924,800.

These records of service to the public by the aeronautics industry testify to the fact that air transportation has something to offer—something that people want and are willing to pay for. Air transportation really did not begin in the United States as a commercial project until 1926—what had been done before that time was largely experimental and development work. In these four years it has seen a substantial growth in transportation of mail, passengers and express.

Production Will Return to Normal

MANUFACTURERS of aircraft have been increasing their output practically every year for some 10 years. During the World War many aircraft were built that did not see service, and these were thrown onto the market after the armistice. These sales influenced the efforts of commercial manufacturers for some time until the war surplus equipment was exhausted. About the end of 1926, production of new planes in quantity had begun, and from 1927 to 1930 aircraft production increased rapidly. However, in the first nine months of 1930 there was a noticeable drop, just as there was in other branches of industry. But the policy of retrenchment adopted by the manufacturers indicates nothing more than that they are adjusting themselves to general conditions and there is no reason for doubting that production will return to a normal level in aircraft manufacturing just as rapidly as in other lines.

Manufacturers of aircraft, who are just as skilled in the principles of business economics as they are in designing, constructing and flying aircraft, are paying strict attention to the needs and desires of an intelligent and discriminating aircraft market. They are making every effort to design and produce aircraft which their experiences and studies have indicated that the public wants. At the same time they are projecting plans continually on new developments, new designs, and new features in an effort to keep in the van of public desire.

Automobile Industry Looks for Four-Million Car Year

(*Concluded from page 15*)

less than its normal quota of business.

Used Car Problem Appears Nearer a Solution

THE industry has made long strides toward solving the vexing used car problem. The National Automobile Chamber of Commerce is sponsoring a cooperative junking program adhered to by manufacturers who in 1929 supplied 70 per cent of the cars going to the domestic market. Other makers are on the verge of adopting junking plans. Ford's method of salvaging materials from old cars on a disassembly line at the Rouge plant is one of the most interesting developments of the year, a total of 38,000 cars having been scrapped by this method. There is ample assurance that further progress in the junking and salvaging programs will be made in 1931.

Invasion of the American market by small foreign-designed cars has been far from successful. If low-priced domestic manufacturers thought they had a new worry on their hands when these cars were introduced, they know now that they can dismiss the newcomers as serious competitors. The bantam companies are trying to combat an idea which American makers have firmly implanted in the minds of the motorist—that he should get the biggest car for his money.

Foreign Trade May Not Be Seriously Affected

RECENT action of foreign countries in adopting measures of reprisal against America's high tariff laws is not likely to affect materially foreign sales of automobile manufacturers. In almost all cases these measures have been in the form of duties on finished cars, whereas large American makers are leaning heavily toward the policy of operating assembly plants in foreign countries manned by native workers. Moreover, companies like Ford are preparing to make parts in foreign plants and to get bodies and wheels from nearby factories owned and operated by old-line American body and wheel makers. They can even obtain steel made under the supervision of Americans, such as Armco sheets in England.

The automobile industry is proud of the fact that it is the largest consumer of steel. Indications point to the fact that it will retain this position in the future. One authority within the industry goes so far as to state privately that "automobile manufacturers will continue to be the largest users of steel and will show a slight growth in the actual amount consumed in the next decade."

Progress of Blast Furnace Practice in 1930

(*Concluded from page 33*)

especially the sizing of ore, coke and limestone. The old theory of having big lumps of limestone and big pieces of coke "to keep the furnace open," has long been discarded, but not until recently has there been satisfactory study of the phenomena of heat exchange between the hot ascending gases and the lumps of descending solids. I believe that one of the contributing factors to the slowness of the old anthracite blast furnaces was the enormous size of the "steamboat coal" for fuel. It was not possible to get the egg size for blast furnaces in those days, but such practice would have prolonged the life of the anthracite furnaces. Sized coke is becoming usual practice and even the nut sizes are being used filled separately.

The beneficiation of iron ores often necessitates close sizing and in some cases these sizes can be kept separate and filled, as was the case in the furnace of the Columbia Steel Corporation at Ironton, Utah (Technical paper No. 459 "Effect of Sized Ore on Blast-Furnace Operation," by S. P. Kinney, United States Bureau of Mines, 1930).

Sintering is still the usual method for preparing the fines for the blast furnace, and some large units were installed this past year. The self-cleaning automatic grate and the new method of charging the material into the pan has increased the capacity of the 10 x 24-ft. Greenawalt pan up to 650 tons a day of sinter from magnetic fines.

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

(ESTABLISHED 1855)

A Word for 1931

BRIGHT spots in the picture for 1931 include a rapidly growing belief on the part of the man in the street that there is plenty of money to keep the wheels of commerce turning. Pessimism is apparently beginning to vaporize. Probably nothing is more needed than a general change of attitude from gloom to one of confident hope.

Most of 1930 was spent in apprehending that for the five years ended in mid-1929 production of steel exceeded needs by probably 6 per cent and in the last two of them by 11 per cent. The reaction depressed operations to a level 30 per cent below even mere wear and tear requirements, let alone normal needs. Such sub-normal production can hardly remain for long.

At the End of 1930

IT is perhaps too early to assay the inspiration of the forebodings of evil that have beclouded so many persons during 1930. A coming shortage of gold. A Russian menace. A downfall of the individualistic system of economy. A diagnosis that many industries are bent upon committing suicide. A prognosis that another world-war is looming into sight. A dissolution of the parliamentary system of government, and consequently anarchy. Some of these thoughts seem rather absurd. Yet, they have been seriously entertained, for which the flood of liquidation was evidence. If we held them we should not venture to refer to the economic depression of 1929-31 which implies belief in a recovery in 1931.

Without minimizing the gravity of the adversities of 1930, produced and aggravated by a variety of factors—the Indian liquidation of silver, a collapse of a senseless speculation in securities, a popular misconception of the nature of wages everywhere, a drought in this country—in a calm view the depression of 1929-31 does not appear to be physically so severe as that of 1920-22, but psychologically it is more so. In this country we have had too much hysteria. Even the unemployment situation is probably exaggerated in some cases under the inspiration of persons who have axes to grind.

Reference to the newspaper files of 1921 discloses that in December of that year there was the depth of gloom and that pessimists were foreboding and ravens were croaking in precisely the same terms as at present. As late as March, 1922, the outlook was commonly viewed blackly. The turn of the tide had previously occurred, but its rise did not become generally discernible until after March. The great lesson that we draw from the study of economic depressions, through a century and more, is that their mechanics are essentially the same, modified by improvements in methods of finance, no matter what may be the difference in causes. We are still unable, however, to measure contemporaneously the depth or quantity of depression, or gage precisely the beginning and end. This is due to the absence of data, which become only partly available years later. There is no economic barograph.

Over-Expansion in Steel

ONE of steel's contributions to the unemployment crisis has been the building of open-hearth furnaces far beyond immediate needs. Last year some 845,000 tons of new capacity was completed and the scale of expansion scheduled for 1931, in the face of an outlook that hardly promises heavy engagement of existing facilities, would easily increase capacity by over 6 per cent. Some of this added plant is already fairly far along toward completion.

Measured by most standards the 845,000 tons of new facilities is large. It compares with an average annual expansion of 700,000 tons in the nine years since the depression year of 1921 and is larger also than the steel-making additions of either of the intervening low-spot years—375,000 tons in 1924 and 630,000 tons in 1927. The total new open-hearth plants of 1921 and 1922 combined did not amount to more than 475,000 tons.

It remains that a greater expansion in 1930 was expected than materialized. A year ago our survey showed that new work of the kind was under way for a total of 4,690,000 tons. Allowing for last year's additions, there would thus seem to be still under construction some 3,845,000 tons. As a matter of fact the tonnage under project at the beginning of this year is now 4,180,000 tons, and so a further swelling of new plant by 335,000 tons is indicated over against any possible abandonments in 1930.

Some question might reasonably be raised as to the wisdom of such large increases at any time, let alone when demand is so low. For example, the history of production since 1921 shows an average annual increase of 1,375,000 tons. What was projected a year ago, had it all been finished, would provide almost three and one-half as much steel as theoretically needed; and what is now on the boards, if all built in 1931, would supply three times the added normal needs of 1931.

Meanwhile there are those increased outputs obtainable by enlargement or by otherwise redesigning existing equipment and by improvements in operation. In the years of 1922 to 1930 inclusive, expansion on this score amounted to 4,700,000 tons, as

the capacity of the industry increased in this period by 11,000,000 tons and new furnaces accounted for only 6,300,000 tons of this. This is another way of saying that, for every 100 tons of new plant, 75 tons in addition was secured from a better handling of old plant.

There is no question that expansion of manufacturing facilities should be controlled, other things being equal, by the rate of growth of consumption rather than in terms of spurts of activity. Along with industry in general the steel makers appear to have lost their perspective, as when such a mountain of new projects could be decided on as was the case a year ago. Allowance may always be made, of course, for plant conceived and located for strategic reasons, and here and there for possibilities that the new is to replace the obsolete, in which case, however, there would be a writing off of the old capacity.

Output of steel ingots in 1928 exceeded that of 1927 by 6,550,000 tons and that of 1929 went beyond the production of 1928 by 4,270,000 tons, and the ever-onward ever-bigger idea that had swept the country may still have had its influence when the steel industry tried to do its bit in contributing to construction, thus to stem the tide of the industrial recession. So it was that instead of laying out new plant on a scale of the order of 1,375,000 tons (the annual increment of the trend of production), there was the total in excess of 4,000,000 tons a year ago and a total likewise in excess of 4,000,000 tons, scheduled for 1931. It is difficult to believe that a very large fraction of the new furnaces will be pushed energetically to completion, except as dictated by the efforts to minimize unemployment within the ranks of the steel industry itself.

Commodity and Food Prices

SIMULTANEOUS appearance of the Bureau of Labor Statistics reports for November on prices of all commodities at wholesale and retail prices of food affords opportunity for an interesting comparison on a subject of no small importance, particularly so since there has been discussion in the columns of THE IRON AGE on how various prices have responded to conditions. On Dec. 4 there was an editorial "Looking for Lower Retail Prices," while Dec. 11 there was a letter from the economist of R. H. Macy & Co., insisting that Macy's retail prices had come down more than wholesale prices, on 269 staple and semi-staple articles (Sept. 1, 1929, being taken as base, and July 1, 1930, showing 84.0 for wholesale and 81.3 for retail). Then Dec. 25 there appeared a letter from a St. Louis correspondent, commending THE IRON AGE editorial of Nov. 13, along the line that building costs should come down, and taking issue with the Macy claim of lower retail prices and making some cogent citations.

The Bureau of Labor Statistics index of commodities at wholesale, 1926 being taken as base, stands at 80.4 for last November, against 82.6 for October. Declines have been continuous this year except for August and September.

The retail food index remains based on 1913 as 100, but it is easy to convert the figures to a 1926 base. The 1926 average, based on 1913, was 160.6, and by that factor the 141.4 now issued for last November may be converted into 88.0 relative to 1926. Commodities at wholesale stood at 80.4 and thus food prices at retail are 10 per cent higher, relative to commodities at wholesale, than in 1926.

That is not the whole story, moreover. Food prices were particularly high in 1926 relative to commodities, for commodities ran thus: 1925, 104; 1926, 100; 1927, 95, whereas food prices ran: 1925, 157.4; 1926, 160.6; 1927, 155.4. Thus by a broader comparison retail food prices are more than 10 per cent high at present relative to commodities.

To make these statistical comparisons is not to insist that the mere figures prove that every food store ought at once to reduce prices. The stores might argue that they are making little enough money as it is. For some of them to go out of business whereby other stores could sell more cheaply and make as much money by having a larger turnover would add further to the army of the unemployed.

The points to be taken together and thus emphasized are, first, that wholesale prices have been declining, and somewhat sharply, and second, that retail food prices have not been declining in proportion, which is hard on the people. No one claims that it makes an economic disturbance for the people to be able to live more cheaply.

Miniature Coke Plant

NEW methods for determining the composition and quality of coal with a view to improvement in its utilization are constantly being developed by the United States Bureau of Mines at its Pittsburgh experiment station. One of the most recent developments is a method for determining the amount and quality of carbonization products obtainable from a given coal—that is, the method is designed to compare the carbonizing properties of coals. The apparatus in which this test is made is, in effect, a small coke and gas plant, but arranged for much more accurate control of carbonizing conditions and recovery of products than is possible in a large plant.

The charge of coal used is 75 to 90 lb. This is heated in a welded metal retort, charged into an electric furnace whose temperature can be kept constant automatically, and all the products, including coke, gas, ammonia, tar and water, are measured and analyzed. The quantities of products yielded in a test, of course, vary with the coal and the carbonizing temperature maintained, but as much as 60 lb. of coke, 500 cu. ft. of gas, and ½ gal. of tar with other products in proportion, are usually obtained. These quantities are sufficient for exhaustive analysis and testing.

A method for testing the relative strength of iron ores has been developed by the United States Bureau of Mines, in cooperation with the Mines Experiment Station, University of Minnesota. Previous investigations have shown that the physical condition of the material in the stock column of a blast furnace affects the mechanical operation as well as the efficiency.

New Steel Capacity of 845,000 Tons

(*Concluded from page* 106)

ture automobile and steel furniture sheets.

Other Steel Works Additions

Midvale Co., Nicetown, Philadelphia, has about completed the construction of a new chemical, physical and research laboratory with modern equipment. No noteworthy changes affecting capacity were made last year.

Inland Steel Co., Chicago, completed last year a new 10-in. mill. An expansion program during 1931 will probably be carried out but no definite plans have yet been decided upon.

Wheeling Steel Corporation, Wheeling, W. Va., plans the addition of shearing and cold-rolled auxiliary equipment for its 48-in. continuous mill at Steubenville, Ohio, works.

Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., last year installed a 300-gal. per min. pump of 1800-lb. pressure, and a 750-ton hydraulic press.

Keystone Steel & Wire Co., Peoria, Ill., last year replaced one row of regenerative soaking pits with one-way fire pits. It also replaced an old motor generator set with a new and larger capacity unit.

Washburn Wire Co., Phillipsdale, R. I., added last year two stands to its No. 2 rod mill and built a new blooming mill furnace which increases the company's capacity.

New Capacity in Electric Furnaces

NO extended attempt is made to secure details of additions to electric furnace capacity. Among the new installations reported in the returns on these pages are the following:

	No.	Size
National Erie Co.	1	5-ton
Atlas Steel Casting Co.	1	3-ton
Republic Steel Corpn.	1	25-ton
Industrial Steel Castings Co.	1	3-ton

Doubtless there have been many other installations not reported. Reliable estimates place the total electric arc furnaces in the steel industry at about 600 of all sizes.

Rapid Expansion of High-Frequency Type

The striking development of 1930 has been the expansion in the application of the **Ajax-Northrup** high-frequency induction furnace to the steel industry. The size of these furnaces, first introduced only in very small units, are now being built and used in sizes up to 3½ tons. The present status of the furnace, according to data furnished by the Ajax Electrothermic Corpn., Trenton, N. J., is given in the table.

Besides the units listed in the table, there has been ordered one 1250-kw., 3000-lb. furnace with a 24-hr. capacity of 95,000 lb., and one 1125-kw., 3½-ton furnace with a 24-hr. capacity of 88,000 lb., by two large companies.

Blast Furnace Construction

IMPROVEMENTS and additions to blast furnace construction, not included in the foregoing reports of steel companies or in the introduction to this review, are as follows:

The Federal Furnace Co., Chicago, built last year a new dock and ore bridge and has installed three turbo blowers. The construction of a new 1000-ton blast furnace has been postponed.

Hudson Valley Fuel Corporation, Troy, N. Y., added last year at its by-product coke plant a battery of 31 Koppers ovens with a daily capacity of 550 tons of coke, and two 10-ft. Koppers gas producers for underfiring the foregoing battery.

Additions to Rolling Mills

SOME substantial changes and additions to the rolling mills of large steel-making companies were made last year and are under way, which are included in the foregoing reports of steel companies. Other data are enumerated in the following paragraphs, with wrought iron makers included among them:

Sharon Steel Hoop Co.

Sharon Steel Hoop Co., Sharon, Pa., placed in operation a continuous high speed strip mill at its Sharon plant with a rated capacity of 20,000 tons monthly. Additions to the cold-rolling department were also completed early in the year, and the company has recently placed in production a modern department for the production and treatment of Nirosta KA-2 and other highly alloyed stainless steel strips, both cold-rolled and hot-rolled.

Generator Rating and Tonnage Capacity of Ajax-Northrup Furnace Equipments

Customer	Generator Rating, Kw.	Furnace Size, Lb.	Lb. Capacity per 24-Hr. Day
Am. Steel Fdys.	60	100	3,600
Babcock & Wilcox Co.	150	1,000	10,000
Bethlehem Stl. Co.	600	600	44,000
	(2—300)	1,000	
Carpenter Stl. Co.	300	1,000	22,000
The Duriron Co.	150	600	10,000
Firth-Sterling Steel Co.	150	1,000	10,000
	300	2,000	22,000
Gilby Wire Co.	150	600	10,000
Haynes-Stellite Co.	60	100	3,600
Heppenstall Co.	150	600	10,000
Hoskins Mfg. Co.	150	300	10,000
	300	600	22,000
Lebanon Steel Fdy.	300	1,000	22,000
The Midvale Co.	200	1,000	13,500
Republic Stl. Corpn.	50	100	2,500
A. O. Smith Corpn.	60	100	3,600
U. S. Bur. of Mines	50	100	2,500
U. S. Bureau of Standards	100	200	7,000
U. S. Pipe & Foundry Co.	300	2,000	22,000
U. S. Arsenal	150	1,000	10,000
	600	2,000	
		4,550	44,000
Westinghouse Elec. & Mfg. Co.	50	100	2,500
	100	250	7,000
Totals	4,480	21,900	313,800

American Tube & Stamping

American Tube & Stamping Plant of the Stanley Works, Bridgeport, Conn., last year put in operation a new hot-rolled strip mill, designed to roll strip from 4 in. to 13 in. wide in coils and lengths. The annual capacity is approximately 60,000 tons per year. This new mill virtually replaces two others which were in operation up to the time of the installation of the new mill, so that the productive capacity remains practically the same as for the previous three years.

Newton Steel Co.

Newton Steel Co., Newton Falls, Ohio, in February, 1930, placed in operation a new sheet mill at Monroe, Mich., with annual capacity of 250,000 tons of full-finished sheets. A full description of the mill appeared in THE IRON AGE of April 10, page 1064.

Other Rolling Mill Changes

West Leechburg Steel Co., Pittsburgh, completed at its Leechburg, Pa., works a 14-stand, 12-in. continuous strip mill, complete with auxiliary equipment. The mill has not yet been placed in operation.

Superior Steel Corporation, Pittsburgh, installed three 5-in. and 18 x 18 in. 4-high roller bearing cold strip mills at its Carnegie, Pa., plant.

Mahoning Valley Steel Co., Niles, Ohio, has added a normalizing furnace, which will place the company in a position to furnish all grades of deep drawing sheet stock.

Acme Steel Co., Chicago, last year added a normalizer for strip steel and an annealing furnace for rustless steel.

Ingersoll Steel & Disc Co., Galesburg, Ill., last year rebuilt one of its 22-in. finishing mills, and installed at its unit a new continuous sheet bar heating furnace of the walking beam type.

A. M. Byers Co.

A. M. Byers Co., Pittsburgh, during October officially opened its new plant at Economy, Pa., for the manufacture of wrought iron by the new Byers mechanical process. Plant includes complete equipment for the manufacture of 45,000 to 50,000 tons of wrought iron monthly, and finishing equipment includes 40-in. blooming mill, universal plate mill equipped to produce plates 48 in. in width, and a 20-18 and 16-in. skelp mill, and a merchant mill for the rolling of rounds, flats, squares and other sections. A complete description of the mill appears in THE IRON AGE of Oct. 16, page 1080-D.

Reading Iron Co.

Reading Iron Co., Reading, Pa., last year installed a 25-ft. electrically heated galvanizing kettle, two 2-in. by 8-in. Taylor-Wilson threading machines, one coupling screwing machine, and various auxiliary buildings and appliances.

During 1931 the company is working on plans to modernize its tube works and rolling mills and to rearrange its furnaces, finishing departments, etc., for more efficient operation.

The company plans to blow in its Keystone blast furnace, which was shut down in 1929, due to a fire in the blowing engine house.

Improvement in Steel Production Is in Prospect

SPECIFICATIONS for January Shipment Show Further Gain — Railroad Buying Increases — Governmental and Utility Projects Approach Contracting Stage

THE iron and steel industry has passed through a year of drastic readjustment. Prices underwent an uninterrupted decline, failing to show signs of stability until late in the fourth quarter. Production, after a post-panic recovery early in the year, resumed the recession that had begun in 1929.

Prices of finished steel, as measured by THE IRON AGE composite, were driven $5.82 a ton below their 1929 peak. The composite of pig iron prices reached the lowest level since November, 1915.

Steel ingot output in 1930, estimated at 40,000,000 tons, was 27 per cent lower than in the previous year. The rate of production, 63 per cent, was the lowest since 1921, a 37 per cent year. The average for the last half of 1930 was barely 51 per cent.

CURRENT raw steel production is highly irregular, owing to the holiday interruptions, but may average 30 per cent for the week. An unlooked for post-Christmas pickup in specifications will probably prevent as general a suspension of mill operations this week-end as occurred between Dec. 24 and Dec. 29. Tin plate output is again above 50 per cent of capacity and sheet and strip mill schedules average 40 per cent. At Chicago, plate mill operations have held up unusually well.

The year-end dip in production was not unexpected, and interest is now centered in prospects for the coming month. Despite pronounced conservatism in the steel trade, each week in December has added to its confidence. There has been a steady gain in contracting for first quarter, although in the case of plates, shapes and bars it has been mainly at pre-advance prices. December specifications, largely for January shipment, are well in excess of November releases.

AN impressive volume of public and utility projects is approaching the contracting stage, delayed railroad tonnage is being placed and tin plate output promises to be large. Steel business now definitely in sight points to an average ingot output of 50 per cent before the end of January. Improvement in operations is expected to continue well into the second quarter, although at this juncture few will venture a prophecy of the extent of the gain.

One reason for expecting a gradual, rather than a sharp, recovery in activity is the uncertain outlook in the automobile industry. No impressive gain in motor car production is looked for until April or May. Yet, in the face of this opinion, Pittsburgh reports that the largest increases in January specifications have come from the automobile makers.

RAILROAD buying of the week has been heartening. Rail purchases total 210,000 tons, including 170,000 tons distributed among various makers by the New York Central and 40,000 tons placed by the Louisville & Nashville with the Ensley mill. The Southern Pacific is about to contract for nearly 60,000 tons, and the Pennsylvania will take early action on its inquiry for 200,000 tons. The Burlington, the Chicago & Eastern Illinois, the Milwaukee, the Rock Island and the Illinois Central will soon place orders for a total of over 125,000 tons.

A number of railroads have come into the market for their first quarter requirements in bars, shapes and plates, and the New York Central will supplement its rail purchase by placing 40,000 tons of track accessories. The Northern Pacific has ordered 1000 box cars from a Pacific Coast car builder, while the Bessemer & Lake Erie will close for 1000 heavy gondola cars early next week. Pending equipment business also includes a good-sized tank car inquiry.

Pipe line programs will be launched sooner in 1931 than was the case in 1930 to insure deliveries while weather conditions are still favorable to laying pipe. One order for about 60,000 tons is about to be placed, and figures are being taken on a 400-mile line for a Standard Oil subsidiary in the Middle West and on a 150-mile line from Colorado to Phoenix, Ariz., which will require a total of 130,000 tons.

Governmental work is conspicuous in the large amount of structural steel work now in the market. New projects call for 65,000 tons, among the larger totals of the past year. Included are bridges for the Great Lakes-to-Gulf waterway, 30,000 tons, and a post office building at Washington, 17,000 tons. Bids were opened at Washington this week on 50 barges for the Inland Waterways Corpn., requiring 28,000 tons.

The year-end decline in operations has caused steel mill executives to increase their efforts to minimize unemployment. One large Middle Western steel plant has succeeded in providing some work for virtually its entire normal labor enrollment.

PITTSBURGH

Signs of Moderate Upturn in Steel Industry in January Accumulate

PITTSBURGH, Dec. 29.—Signs of the usual January improvement in the steel industry continue to accumulate in the Pittsburgh district. Specifications last week, reflecting the expected holiday lull, were light, but tonnage releases on the first day of the new week considerably exceeded the expectations of some steel makers. In many cases these specifications are being released at the last moment in order to take advantage of low-priced contract tonnage, but at the same time mills are beginning to receive rolling orders against contracts booked since the first of the month.

The automobile industry thus far has reflected the largest increase in the extent of its January releases. With this exception, the general run of orders is well distributed throughout consuming industries, and, while the requirements are small in most cases, they represent an encouraging aggregate. New contracts for first quarter are still coming in, and opposition to market prices has reached a comparatively low point.

Following a rather general observance of holiday suspension in Pittsburgh and Valley mills, operations this week are generally improved. Open-hearth furnaces in the Pittsburgh district are engaged at 30 to 35 per cent of capacity, and the average in the Valleys is not much lower. While the suspension of blast furnace activity continues at many plants, most of the stacks which had been banked will be active again in a few days, and some idle units will go into blast. Finishing mill operations reflect a greater improvement this week than open-hearth departments, with tin plate schedules again bettering 50 per cent of capacity, and sheets and strip at about 40 per cent. In other lines improvement has been more moderate, but in these departments suspended activity was less pronounced.

Sheets

Sheet specifications reaching local mills today generally exceeded the expectations of mills. While some improvement was noticed at the close of last week, such a marked increase in demand had not been expected before the beginning of the new year. To a large extent, increased specifications at this time may be attributed to seasonal influence, and it will be at least a month until the true extent of business recovery can be ascertained. The automobile industry has contributed most heavily to recent tonnage aggregates, although a generous number of small orders are coming in from diversified sources to replenish depleted inventories. Sheet mills this week are running at about 40 per cent of capacity, an improvement over the levels maintained before the holidays. Prices are generally holding, and it is estimated that fully 90 per cent of the usual buyers are covered for first quarter at present levels.

Steel specifications for January shipment better than most mills expected, foreshadowing at least moderate improvement in operations in January.

* * *

Automobile industry has been responsible for largest increase, but general run of orders is from all industries.

* * *

Operations this week generally improved, following quite general suspension of activities last week.

* * *

Consumers showing little or no resistance to current price levels.

Pig Iron

While shipments have been sharply reduced in the last two weeks, melters in this district indicate a normal resumption in demand with the beginning of the new year. Considerable contracting for the first quarter has been done, although the larger users are still apathetic regarding their future requirements. Prices are unchanged.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$17.00
Bessemer	17.50
Gray forge	16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.50
Low phos., copper free	$26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$17.50
No. 2 foundry	17.50
No. 3 foundry	17.00
Malleable	18.00
Bessemer	18.00

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.75c.
Reinforcing steel bars	2.75c.
Cold finished and screw stock—	
Rounds and hexagons	3.35c.
Squares and flats	3.85c.
Bands	3.10c.
Hoops	4.10c.
Black sheets (No. 24), 25 or more bundles	3.25c.
Galv. sheets (No. 24), 25 or more bundles	3.85c.
Light plates, blue annealed (No. 10), 1 to 24 plates	2.75c.
Blue annealed sheets (No. 13)	2.65c.
Galv. corrug. sheets (No. 28), per square	4.25c.
Spikes, large	2.65c.
Small	2.90c. to 3.05c.
Boat	3.15c.
Track bolts, all sizes, per 100 count,	60 and 10 per cent off list
Machine bolts, 100 count,	60 and 10 per cent off list
Carriage bolts, 100 count,	60 and 10 per cent off list
Nuts, all styles, 100 count,	60 and 10 per cent off list
Large rivets, base per 100 lb	$3.30
Wire, black, soft ann'l'd, base per 100 lb.	2.40
Wire, galv. soft, base per 100 lb	2.85
Common wire nails, per keg	2.15
Cement coated nails, per keg	2.15

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 3999 lb.

Semi-Finished Steel

Lack of first quarter contracting has prevented clarification of price schedules on billets, slabs and sheet bars, although a number of sellers now indicate that no efforts will be made to maintain prices higher than $30, Pittsburgh. Sales of forging billets have been made at $36, and an increase in the usual differential over rerolling billets might become effective. Wire rods are holding at $35, Pittsburgh or Cleveland, and most of the principal buyers have contracted for first quarter at that figure.

Wire Products

A fair demand for merchant wire products is beginning to come from jobbers, and specifications from the manufacturing trade are improving. Prices are unchanged at $1.90 and $2 a keg for nails, and 2.20c. to 2.30c. for manufacturers' wire.

Strip Steel

Specifications from the automobile industry have aided the strip industry materially in the last week, and operations were resumed in most plants at a good rate this week following a period of suspension Christmas week. Smaller users generally have contracted for first quarter, and releases are already coming in on some of this material. Prices are well maintained at recent levels.

Rails and Track Accessories

The New York Central has distributed its 1931 rail purchase as follows: 71,500 tons to the Bethlehem Steel Co., 62,600 tons to the Illinois Steel Co., 13,900 tons to the Inland Steel Co., 11,380 tons to the Carnegie Steel Co., 8620 tons to the Algoma Steel Corpn. and 2000 tons to the Dominion Steel & Coal Corpn., making a total of 170,000 tons. Rolling on half the order will be begun immediately. Allocation of the Pennsyl-

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Dec. 29, 1930	Dec. 22, 1930	Dec. 2, 1930	Dec. 30, 1929
No. 2 fdy., Philadelphia	$17.76	$17.76	$17.76	$20.76
No. 2, Valley furnace	17.00	17.00	17.00	18.50
No. 2 Southern, Cin'ti	14.19	14.19	14.69	17.69
No. 2, Birmingham	14.00	14.00	14.00	14.50
No. 2 foundry, Chicago*	17.50	17.50	17.50	20.00
Basic, del'd eastern Pa.	17.75	17.75	17.75	19.50
Basic, Valley furnace	17.00	17.00	17.00	18.50
Valley Bessemer, del'd P'gh.	19.26	19.26	19.26	20.76
Malleable, Chicago*	17.50	17.50	17.50	20.00
Malleable, Valley	17.50	17.50	17.50	19.00
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	80.00	80.00	94.00	100.00
Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	30.00	30.00	31.00	34.00
Sheet bars, Pittsburgh	30.00	30.00	31.00	34.00
Slabs, Pittsburgh	30.00	30.00	31.00	34.00
Forging billets, Pittsburgh	36.00	36.00	36.00	39.00
Wire rods, Pittsburgh	35.00	35.00	36.00	40.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.85
Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.60	1.60	1.60	1.90
Bars, Chicago	1.70	1.70	1.70	2.00
Bars, Cleveland	1.65	1.65	1.65	1.90
Bars, New York	1.93	1.93	1.93	2.24
Tank plates, Pittsburgh	1.60	1.60	1.60	1.90
Tank plates, Chicago	1.70	1.70	1.70	2.00
Tank plates, New York	1.88	1.88	1.88	2.17½
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.90
Structural shapes, Chicago	1.70	1.70	1.70	2.00
Structural shapes, New York	1.85½	1.85½	1.85½	2.09½
Cold-finished bars, Pittsburgh	2.00	2.00	2.00	2.30
Hot-rolled strips, Pittsburgh	1.55	1.55	1.55	1.90
Cold-rolled strips, Pittsburgh	2.25	2.25	2.25	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel, *Per Lb. to Large Buyers:*	Dec. 29, 1930 Cents	Dec. 22, 1930 Cents	Dec. 2, 1930 Cents	Dec. 30, 1929 Cents
Sheets, black, No. 24, P'gh.	2.35	2.35	2.35	2.75
Sheets, black, No. 24, Chicago dist. mill	2.45	2.45	2.45	2.75
Sheets, galv., No. 24, P'gh.	2.90	2.90	2.95	3.40
Sheets, galv., No. 24, Chicago dist. mill	3.00	3.00	3.10	3.50
Sheets, blue, No. 13, P'gh.	2.05	2.05	2.05	2.25
Sheets, blue, No. 13, Chicago dist. mill	2.15	2.15	2.15	2.45
Wire nails, Pittsburgh	1.90	1.90	1.90	2.40
Wire nails, Chicago dist. mill	1.95	1.95	1.95	2.45
Plain wire, Pittsburgh	2.20	2.20	2.30	2.40
Plain wire, Chicago dist. mill	2.25	2.25	2.35	2.45
Barbed wire, galv., P'gh.	2.55	2.55	2.60	3.05
Barbed wire, galv., Chicago dist. mill	2.60	2.65	2.75	3.10
Tin plate, 100 lb. box, P'gh.	$5.00	$5.00	$5.00	$5.35
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh.	$12.75	$12.75	$12.75	$15.75
Heavy melting steel, Phila.	11.00	11.00	11.50	14.50
Heavy melting steel, Ch'go.	10.00	10.00	10.00	12.50
Carwheels, Chicago	11.75	11.75	11.75	13.75
Carwheels, Philadelphia	14.00	14.00	14.00	15.00
No. 1 cast, Pittsburgh	12.50	12.50	12.50	14.50
No. 1 cast, Philadelphia	12.00	12.00	12.00	15.00
No. 1 cast, Ch'go (net ton)	9.50	9.50	9.50	13.50
No. 1 RR. wrot., Phila.	13.50	13.50	13.50	15.00
No. 1 RR. wrot., Ch'go (net)	8.50	8.50	8.50	12.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.50	$2.50	$2.50	$2.60
Foundry coke, prompt	3.50	3.50	3.50	3.75
Metals, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Lake copper, New York	**10.62½**	10.12½	12.12½	18.12½
Electrolytic copper, refinery	**10.25**	10.00	11.25	17.75
Tin (Straits), New York	**26.87½**	25.37½	25.87½	39.30
Zinc, East St. Louis	**4.12½**	4.05	4.07½	5.45
Zinc, New York	**4.47½**	4.40	4.42½	5.80
Lead, St. Louis	4.95	4.95	4.95	6.10
Lead, New York	5.10	5.10	5.10	6.25
Antimony (Asiatic), N. Y.	7.10	7.10	7.10	8.12½

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

vania's inquiry will probably be announced on Jan. 2. A considerable part of the Pennsylvania inquiry will call for 131-lb. rails instead of the usual 130-lb. type, and special accessories will be required for the laying. Pittsburgh mills have been asked how soon they will be able to make deliveries on these accessories. The Baltimore & Ohio has not yet taken action against its recent inquiry for accessories, and the Erie is still in the market. The New York Central is in the market for 2500 to 5000 tons of steel wheels.

Tubular Goods

Negotiations for considerable line pipe tonnage will get under way soon after the first of the year. A definite prospect is a line from the Texas gas field to Colorado, Nebraska and Wyoming points, requiring about 400 miles of large diameter pipe. The Columbia Gas & Electric Corpn. is also expected to go forward with its projected line from West Virginia to Washington and Baltimore. As mentioned last summer, this project called for a twin line over the mountains and is one of the largest in prospect for 1931. Pipe mills have been largely idle for the last week or two, but a few units will resume production next week. Demand for standard pipe is steady, although in reduced volume. The other lines are dull.

Cold-Finished Steel Bars

Specifications have been heavier in the last few days, particularly from the automotive industry. While mills were generally suspended Christmas week, operations were resumed Monday at most plants. Prices continue at 2c. to 2.10c., Pittsburgh.

Bars, Plates and Shapes

Specifications for January delivery have been reaching Pittsburgh mills in fair volume during the last week. First quarter contracting has been reasonably satisfactory, although large users are still hesitant in making commitments, particularly on bars. Increased demand for bars from the automotive industry has been a feature of the market, and the requirements of the cold-finishing mills are somewhat higher. The 1.65c. price is still quoted, although large users have been able to cover for the quarter at 1.60c. Shipments against old contracts taken at lower figures have largely been completed, and mills have taken some specifications in the last week for urgent shipment in order to take advantage of such prices.

Tin Plate

Tin plate production this week has jumped to at least 50 per cent of capacity after rather general suspensions Christmas week. With contracts for 1931 nearly all settled, mills are able to work freely on anticipated tonnage, and container manufacturers believe that 1931 consumption will not be below normal. The official price remains unchanged at $5 a base box, Pittsburgh.

Coke

The coke market is very dull, with the furnace grade holding around $2.50, Connellsville, and the foundry product ranging from $3.25 to $4.85 for the premium grades. Demand for domestic coke and coal is disappointing.

Old Material

With no mill buying in the last week, scrap prices are showing no change on any of the principal grades. Dealers now believe that mill buying cannot be long delayed, and it is generally indicated that an advance in buying prices may be made before the

THE IRON AGE COMPOSITE PRICES

	Finished Steel	Pig Iron	Steel Scrap
Dec. 29, 1930	2.121c. a Lb.	$15.90 a Gross Ton	$11.25 a Gross Ton
One week ago	2.121c.	15.90	11.25
One month ago	2.135c.	16.02	11.42
One year ago	2.362c.	18.21	14.25
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Steel Scrap High	Steel Scrap Low
1930	2.362c., Jan. 7	2.121c., Dec. 9	$18.21, Jan. 7	$15.90, Dec. 16	$15.00, Feb. 18	$11.42, Dec. 9
1929	2.412c., April 2	2.362c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.391c., Dec. 11	2.314c., Jan. 3	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 2
1927	2.453c., Jan. 4	2.293c., Oct. 25	19.71, Jan. 4	17.54, Nov. 1	15.25, Jan. 11	13.08, Nov. 22
1926	2.453c., Jan. 5	2.403c., May 18	21.54, Jan. 5	19.46, July 13	17.25, Jan. 5	14.00, June 1
1925	2.560c., Jan. 6	2.396c., Aug. 18	22.50, Jan. 13	18.96, July 7	20.83, Jan. 13	15.08, May 5

end of January. Sellers are not willing to dispose of any significant tonnages of heavy melting steel at $13, Pittsburgh, unless hard pressed, and are having more difficulty in buying against recent orders at as low as $12.50. Specialties have retained their recent strength and, with increased activity among the steel foundries, a number of purchases of these grades may be expected in the near future.

The monthly list of the Baltimore & Ohio Railroad, closing Jan. 5, contains 21,000 tons, including 5000 tons of No. 1 heavy melting steel, 7000 tons of steel rails and 2000 tons of car wheels.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$12.50 to $13.00
No. 2 heavy melting steel	10.50 to 11.00
Scrap rails	12.00 to 12.50
Compressed sheet steel	12.00 to 12.50
Bundled sheets, sides and ends	10.00 to 10.50
Cast iron carwheels	13.50 to 14.00
Sheet bar crops, ordinary	13.50 to 14.00
Heavy breakable cast	9.00 to 9.50
No. 2 railroad wrought	12.50 to 13.00
Hvy. steel axle turnings	10.50 to 11.00
Machine shop turnings	6.00 to 6.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	16.00 to 16.50
Railr. coil and leaf springs	16.00 to 16.50
Rolled steel wheels	16.00 to 16.50
Low phos. billet and bloom ends	17.00 to 18.00
Low phos. mill plates	15.50 to 16.00
Low phos. light grades	15.50 to 16.00
Low phos. sheet bar crops	16.50 to 17.00
Heavy steel axle turnings	10.50 to 11.00
Electric Furnace Grades:	
Low phos. punchings	15.50 to 16.00
Heavy steel axle turnings	10.50 to 11.00
Blast Furnace Grades:	
Short shoveling steel turnings	7.50 to 8.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Rolling Mill Grades:	
Steel car axles	18.00 to 18.50
Cupola Grades:	
No. 1 cast	12.00 to 13.00
Rails 3 ft. and under	14.00 to 14.50

Arthur G. McKee & Co., Cleveland, engineers and contractors, announce that they have made an arrangement with the Whessoe Foundry & Engineering Co., Ltd., Darlington, England, under which the latter will act as the exclusive manufacturing agent in Great Britain for McKee oil refinery and blast furnace equipment.

CHICAGO

Drastic Curtailment of Steel Operations Over the Holidays

CHICAGO, Dec. 29.—The Christmas holiday week took heavy toll of Western steel mill operations. Practically all units, with the exception of several plate mills, closed down last Wednesday night and did not resume production until Sunday night, thereby forcing down output to the average of 20 per cent for that week. Rolling schedules lack support of specifications, with the result that operations have not snapped back, and output now stands at a scant 30 per cent of capacity.

Steel mill blast furnace output has likewise suffered, two stacks having been banked, but producers are hoping that these furnaces can be brought back into service soon after Jan. 1. There are now active 12 of 36 steel mill blast furnaces.

Prices at the year end show little tendency to move one way or the other. Quotations of 1.70c. a lb., Chicago, on plates, shapes and bars are being made at present, but it is in the minds of some producers to attempt the 1.75c. price after Jan. 1. The sluggishness of rail contracting is an important factor in the relatively small size of mill books, which are lean even when compared with the close of 1929.

Ferroalloys

Forward contracting to date compares favorably with the tonnage put on books a year ago. Recently announced prices are holding.

Pig Iron

Sales of Northern iron have continued at a substantial rate through the holiday week. Releases also are important in that they give further evidence that January shipments will turn upward. Four merchant stacks are active at 60 per cent of capacity. Sentiment in the Southern iron market is swinging to quotations of $11 to $11.50 a ton, Birmingham, for delivery in the Chicago district. Charcoal iron is holding at $24 a ton, furnace, for the general run of business, though old contracts are being renewed below this figure and resale iron is being offered at cut prices.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$17.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.00
Malleable, not over 2.25 sil.	17.50
High phosphorus	17.50
Lake Super. charcoal, sil. 1.50	27.04
S'th'n No. 2 fdy.	17.51
Low phos., sil. 1 to 2 copper free	$28.50 to 29.20
Silvery, sil. 8 per cent	26.79
Bess. ferrosilicon, 14-15 per cent	35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Cast Iron Pipe

Sellers will enter the new year with a fair amount of inquiry on which to work, the prospects for January business having improved measurably in recent weeks. Prices for 6-in. and larger diameter pipe appear to be steady at $35 to $38 a ton, Birmingham.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $43 to $46; 4-in., $46 to $49; Class A and gas pipe, $3 extra.

Rail and Track Supplies

Distribution of rails and splice bars by the New York Central brought 62,600 tons to the Illinois Steel Co. and 13,900 tons to the Inland Steel Co. This railroad is expected to enter the market soon for a total of 40,000 tons of tie plates and spikes for new track work and the necessary supplies for maintenance. Other orders for rails, including the needs of several frog and switch manufacturers, call for 8000 tons. The Burlington, the Chicago & Eastern Illinois, The Milwaukee Road, the Rock Island and the Illinois Central are being counted on to place orders for a total of over 125,000 tons of rails at an early date. Western rail mills closed down last Wednesday night and did not re-

sume operations during the remainder of the week.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 1.95c.; angle bars, 2.75c.

Sheets

Probably the most interesting phase of the local sheet market is the fact that producers' books at the end of 1930 are substantially better than the tonnage carried over from 1929. The year end is a period of inactivity for users and producers alike. Hot mills were off from Wednesday night to Sunday night and, taking this into consideration, production has not been above 25 per cent. Quotations named up to Christmas Day developed no new weakness, but rather a tendency to hold better at the levels established at that time. The move started in November to readjust extras on wide black sheets is spreading.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.50c. to 2.60c.; No. 24 galv., 3.05c. to 3.15c.; No. 10 blue ann'l'd, 2.05c. to 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Bolts, Nuts and Rivets

Releases on hand promise heavier shipments in January. Farm implement manufacturers are expanding activity, though the move is not by any means general in the industry.

Reinforcing Bars

The Great Lakes Dredge & Dock Co. has been awarded the general contract for the Ogden Avenue link in Chicago, and a large tonnage of paving reinforcing will come up in Illinois in January. Current awards are light. Prices remain weak and variable.

Plates

Western plate mills were practically the only units that held closely to operating schedules during Christmas week. This is accounted for by the use of plates for line pipe manufacture. Inquiries for delivery in January show slight increase, whereas purchases have fallen sharply. New orders for tanks call for less than 500 tons of steel.

Structural Material

Action on pending projects is being delayed until January. It is probable that the Federal Government will extend aid to Illinois in the completion of the Lakes to Gulf waterway and that bids will soon be taken on bridges calling for 30,000 tons. The general contract for the Ogden Avenue link, Chicago, has been let and steel awards for two bascule bridges and a mile-long viaduct are in early prospect.

Bars

Bar mill output in the last week of the old year did not exceed 20 per cent of capacity. However, specifications for most kinds of bars have been accumulating and producers expect January shipments to show considerable improvement. Prices for mild steel bars are steady at 1.70c. a lb., Chicago.

Wire Products

Releases during the final week of 1930 were light and specifications for January delivery offer little encouragement. It is worthy of note, however, that inquiries and specifications from farm implement manufacturers have turned upward slightly.

Old Material

The local market is dormant. Most foundries are down for the remainder of the year and steel mills are on reduced schedules, consequently the movement of scrap to consumers has all but ceased. In a period like this, incoming shipments are always somewhat troublesome to dealers, but production of scrap has been low for some time, and consequently the movement to the market is small. Although some users have accumulated sizable stocks, this is not by any means universal and on this score brokers are hopeful that by mid-January sales will have become more active.

Prices deliv'd Chicago district consumers:

Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel	$10.00 to $10.50
Shoveling steel	10.00 to 10.50
Frogs, switches and guards, cut apart, and misc. rails	11.25 to 11.75
Factory hyd. comp. sheets	8.50 to 9.00
Drop forge flashings	7.75 to 8.25
No. 1 busheling	7.50 to 8.00
Forg'd cast and r'l'd steel carwheels	13.50 to 14.00
Railroad tires, charg. box size	13.50 to 14.00
Railroad leaf springs cut apart	13.50 to 14.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	12.00 to 12.50
Coil springs	13.50 to 14.00
Electric Furnace Grades:	
Axle turnings	9.25 to 9.75
Low phos. punchings	11.50 to 12.00
Low phos. plates, 12 in. and under	11.50 to 12.00
Blast Furnace Grades:	
Axle turnings	5.25 to 5.75
Cast iron borings	5.50 to 6.00
Short shoveling turnings	5.00 to 5.50
Machine shop turnings	4.25 to 4.75
Rolling Mill Grades:	
Iron rails	11.00 to 11.50
Rerolling rails	12.50 to 13.00
Cupola Grades:	
Steel rails, less than 3 ft.	12.50 to 13.00
Steel rails, less than 2 ft.	13.50 to 14.00
Angle bars, steel	11.75 to 12.25
Cast iron carwheels	11.75 to 12.25
Malleable Grades:	
Railroad	12.25 to 12.75
Agricultural	11.25 to 11.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heavier	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:	
Iron angle and splice bars	10.50 to 11.00
Iron arch bars, and transoms	11.00 to 11.50
Iron car axles	20.00 to 21.00
Steel car axles	13.00 to 13.50
No. 1 railroad wrought	8.50 to 9.00
No. 2 railroad wrought	8.75 to 9.25
No. 1 busheling	6.50 to 7.00
No. 2 busheling	4.50 to 5.00
Locomotive tires, smooth	12.50 to 13.00
Pipes and flues	5.50 to 6.00
Cupola Grades:	
No. 1 machinery cast	9.50 to 10.00
No. 1 railroad cast	9.00 to 9.50
No. 1 agricultural cast	8.50 to 9.00
Stove plate	7.50 to 8.00
Grate bars	7.00 to 7.50
Brake shoes	7.25 to 7.75

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.90c.
Reinforcing bars, billet steel	1.70c.
Rail steel reinforcement	1.50c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.35c.
Flats and squares	3.85c.
Bands $\frac{3}{8}$ in. (in Nos. 10 and 12 gages)	3.10c.
Hoops (No. 14 gage and lighter)	3.65c.
Black sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes ($\frac{7}{16}$ in. and larger)	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.

	Per Cent Off List
Machine bolts	60 and 10
Carriage bolts	60 and 10
Coach or lag screws	60 and 10
Hot-pressed nuts, sq., tap. or blank,	60 and 10
Hot-pressed nuts, hex., tap. or blank,	60 and 10
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	$2.30 to 2.55
Cement c't'd nails, base per keg	2.30 to 2.55

Youngstown

Blast Furnaces to Resume Within Two Weeks

YOUNGSTOWN, Dec. 29.—Within the next 15 days, it is expected that blast furnace resumptions will be made by the Carnegie Steel Co., Youngstown Sheet & Tube Co., Republic Steel Corpn. and the Sharon Steel Hoop Co. This week 20 of 51 independent open-hearth furnaces in the district will be active, and schedules average from 35 to 40 per cent.

Detroit Scrap Stagnant

DETROIT, Dec. 29.—The scrap market has been virtually at a standstill during the holiday period. Transactions have not been in sufficient volume to test prices.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$9.50 to $10.00
Borings and short turnings	4.75 to 5.25
Long turnings	3.75 to 4.25
No. 1 machinery cast	10.00 to 10.50
Automotive cast	11.50 to 12.00
Hydraul. comp. sheets	9.00 to 9.50
Stove plate	7.25 to 7.75
New No. 1 busheling	8.00 to 8.50
Old No. 2 busheling	3.50 to 4.00
Sheet clippings	6.00 to 6.50
Flashings	7.75 to 8.25

CLEVELAND

Specifications for Steel Small But in Better Total Volume

CLEVELAND, Dec. 29.—Mills during the week received a moderate volume of business in specifications for January requirements, but orders generally are small. With first quarter prices the same as have been prevailing except on steel bars for shipment from Cleveland to outside points, there has been no incentive, on other products, to specify in excess of early needs. Considerable business in contracts for the first quarter has been placed for steel bars, plates and shapes and a moderate amount of contracting has been done in sheets and hot-rolled strip. A slight upturn in the demand for steel is looked for in January, although in this territory this will depend largely on operations of automobile manufacturers.

A leading Akron tire manufacturer is planning a 50 per cent increase in production about Jan. 15, and this is regarded as a good indication of a start in an upward trend in the general business situation. Some of the steel consuming industries outside the motor car field are expected in January to increase operations, which recently have been light. There is little activity in the building field. In view of the unemployment situation, efforts are being made to speed up plans for highway bridges and various other public building projects. The rail tonnage to be placed in this territory for 1931 is likely to be scaled down because of decrease in railroad earnings.

Cleveland steel plant operations were increased to 50 per cent of ingot capacity this week by the starting up of one open-hearth furnace. This is better than these plants have done since early in October.

Pig Iron

With the usual holiday lull, sales by Cleveland interests declined the past week to about 6000 tons. Little new inquiry came out. With many foundries closed for the holidays, shipping orders have fallen off, although one producer will ship nearly as much iron this month as in November. Lake furnace prices are well stabilized at $16 to $16.50 for foundry and malleable iron for Ohio and northern Indiana, $17.50 for Michigan, and $17.50, Cleveland, for local delivery.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$17.50
S'th'n fdy., sil. 1.75 to 2.25	17.01
Malleable	17.50
Ohio silvery, 8 per cent	25.00
Stand. low phos., Valley	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

Semi-Finished Steel

A local mill announces that it will meet the $30 price that has appeared in the Valley district on sheet bars, billets and slabs for the first quarter, but consumers as yet are not showing any interest in contracts. Some shipments were made during the week against expiring contracts.

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.85c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex	3.40c.
Cold-fin. flats and sq.	3.90c.
Hoops and bands, No. 12 to ¼ in., inclusive	3.10c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	*3.35c.
Black sheets (No. 24)	3.60c.
Galvanized sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.10c.
No. 9 ann'l'd wire, per 100 lb	$2.35
No. 9 galv. wire, per 100 lb	2.80
Com. wire nails, base per keg	2.25

*Net base, including boxing and cutting to length.

Bars, Plates and Shapes

Orders the past week have been fairly numerous, but mostly for small lots. Orders received by some of the mills this month showed a fair gain over those of November. The activity was largely in steel bars. Specifications from outside consumers have been mostly against 1.60c., Cleveland, contracts. Most consumers have placed first quarter contracts.

Sheets

While mills entered a fair number of orders during the week, they were for small lots, buyers as a rule ordering only material that they will need early in January. While there has been some first quarter contracting, many consumers are showing no interest in contracts. Prices are firm, with minimum quotations generally prevailing on grades which carry a price spread.

Strip Steel

Mills received few orders for either hot-rolled or cold-rolled strip during the week. Stamping plants doing automotive work have curtailed operations because of the slowing down of the automobile plants for the holidays. While there has been quite a little contracting for hot-rolled strip for the first quarter, few contracts have been placed for the cold-rolled material. Prices are steady.

Old Material

Mills are taking virtually no scrap and some will start the year with fairly large stocks. Owing to reduced production, little scrap is coming on the market at present. As large stocks in dealers' yards were bought on a declining market, some of the dealers will suffer losses when they make sales unless there is a rather sharp price advance. Prices are unchanged and nominal.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$10.25 to $10.75
No. 2 heavy melting steel	9.75 to 10.25
Compressed sheet steel	9.75 to 10.00
Light bundled sheet stampings	8.50 to 9.00
Drop forge flashings	9.75 to 10.00
Machine shop turnings	4.75 to 5.25
Short shoveling turnings	7.75 to 8.00
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	10.00 to 10.50
No. 1 busheling	9.50 to 10.00
Pipes and flues	6.50 to 7.00
Steel axle turnings	9.50 to 10.00
Acid Open-Hearth Grades:	
Low phos., billet bloom and slab crops	16.50 to 17.00
Blast Furnace Grades:	
Cast iron borings	7.00 to 7.25
Mixed borings and short turnings	7.00 to 7.25
No. 2 busheling	6.50 to 6.75
Cupola Grades:	
No. 1 cast	12.00 to 12.50
Railroad grate bars	10.00 to 10.50
Stove plate	10.50 to 11.00
Rails under 3 ft.	16.00 to 16.50
Miscellaneous:	
Rails for rolling	16.25 to 16.50
Railroad malleable	12.50 to 13.00

Detroit

January Promises Some Gain in Automobile Industry

DETROIT, Dec. 29.—The holiday season has brought suspension of production by several automobile companies, together with reduced operations by others. Ford's Rouge plant, aside from the experimental department, is closed until Jan. 5, Buick is down, Studebaker and Auburn are back on fair schedules after a shutdown. Chrysler is turning out 150 cars a day, five days a week, and Nash 175 daily. Reo is assembling about half the number of cars as in November, manufacturing 50 cars a day, five days a week. Hupp is almost at a standstill, and De Soto has been on irregular schedules. Oakland-Pontiac is reported to have adhered fairly well to a program of 5000 cars this month. Willys-Overland has been on a basis of 300 cars a day, five days a week, Oldsmobile 100 cars a day. The new DeVaux six tentatively has 1500 cars planned for February and 2000 for March. The two brightest spots are Chevrolet, with some 60,000 units assembled in December, and Hudson-Essex with better than 2000 a week. The latter now has more than 10,000 men on its payroll as against 3500 a month ago.

No one in the local steel trade or in the automobile industry believes that the mere turning of the calendar to 1931 is going to cure present ills. January promises some improvement in motor car output, with Chevrolet leading the upswing, but the gain will not be startling. It is doubtful whether the first quarter will bring a total production of more than 750,000 units, which would be at an annual rate of 3,000,000 cars, almost a full half-million behind this year's poor performance. Some of the important automobile makers are privately expressing the opinion that material betterment in sales will not come before March or April.

NEW YORK

New York Central Orders 170,000 Tons of Rails

NEW YORK, Dec. 29.—The pig iron market shows the effects of the holiday and inventory shutdowns. Bookings, at 5000 tons, compare with 6000 tons in the previous week and 7500 tons two weeks ago. Few new inquiries have appeared and specifications are light, pending post-inventory resumptions of foundry operations. The Worthington Pump & Machinery Corpn., which was in the market for 2400 tons for Harrison, N. J., and Buffalo, is understood to have bought part of its requirements for the latter plant. The inquiry of the Thatcher Co., Newark, for 3000 tons is still open. The price situation shows little change, with competition keenest in nearby New Jersey.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.41 to $20.91
*Buff. No. 2, del'd east. N. J.	18.28 to 19.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	17.39 to 18.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	17.89 to 18.89

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Cast Iron Pipe

Inquiries for gas pipe now in the market from large public utilities are not expected to be closed for another week or more. The Allied Light & Power Corpn., New York, has been seeking prices on an unstated tonnage of pipe, and there are a number of inquiries from smaller utilities. Prices of Northern makers are unchanged at $35 to $36 a net ton, f.o.b. foundry.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $37.90 to $38.90; 4-in. and 5-in., $40.90 to $41.90; 3-in., $47.90 to $48.90. Class A and gas pipe, $3 extra.

Reinforcing Bars

Market activity has declined under the influence of the holiday season, but prospective work for the coming year looms large. Public works projects now under consideration will take a particularly large amount of reinforcing steel.

For mill shipment, distributers of concrete bars quote 1.70c. a lb., Pittsburgh, on building and paving work, and 1.80c. on subway work (rail steel offered at $4 a ton less); for delivery from local stock, 2.35c. a lb., New York, up to 3.05c. a lb. for lots of less than 2 tons.

Finished Steel

Except for the award of 170,000 tons of rails for 1931 shipment by the New York Central, the amount of steel buying in this market in the past week was very light. The New York Central rail order was divided as follows: 71,500 tons to Bethlehem Steel Co.; 62,600 tons to Illinois Steel Co.; 13,900 tons to Inland Steel Co.; 11,380 tons to Carnegie Steel Co.; 8260 tons to Algoma Steel Corpn. of Canada, and 2000 tons to Dominion Steel & Coal Corpn. of Canada. Half of the order is for early delivery and the remainder will be spread out through 1931.

Consumers of steel are slow to place orders for January shipment. Specifications against first quarter contracts are small. Nearly all regular contract buyers have signed up for the coming three months, but the amount that will be taken out next month is still uncertain. Nearly all of the larger buyers have covered for plates, shapes and bars at 1.60c., Pittsburgh, or 1.70c., eastern Pennsylvania mills when the latter basing points apply, and it appears that the recent advance of $1 a ton will be obtained only from small-lot and occasional buyers. Contracts for sheets and strip steel have also been quite generally made at the minimum prices that have been in effect recently.

Old Material

With most scrap consumers closed for part or all of the holiday week, the movement of scrap is limited to shipments of occasional carloads on existing contracts. A small purchase of No. 1 heavy melting steel has been expected from a Claymont, Del., mill, but has failed to develop. In the absence of transactions, prices are unchanged.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel		$7.50
Heavy melting steel (yard)	$5.25 to	5.50
No. 1 hvy. breakable cast	6.75 to	7.75
Stove plate (steel works)		5.00
Locomotive grate bars		5.00
Machine shop turnings		3.50
Short shoveling turnings		3.50
Cast borings (blast fur. or steel works)		3.50
Mixed borings and turnings		3.00
Steel car axles		14.00
Iron car axles	17.50 to	18.50
Iron and steel pipe (1 in. dia., not under 2 ft. long)		7.25
Forge fire		7.00
No. 1 railroad wrought		8.75
No. 1 yard wrought, long		7.75
Rails for rolling	9.25 to	9.75
Stove plate (foundry)		5.50
Malleable cast (railroad)	9.50 to	10.00
Cast borings (chemical)	8.50 to	9.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$12.50
No. 1 hvy. cast (columns, bldg. materials, etc.); cupola size	10.50
No. 2 cast (radiators, cast boilers, etc.)	10.00

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars, small shapes	3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Blue ann'l'd sheets (No. 10)	3.25c. to 3.40c.
Black sheets (No. 24*)	3.65c. to 3.75c.
Galvanized sheets (No. 24*)	4.25c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	65
1 x 30 in. and smaller	65
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65
¾ x 20 in. and smaller	65
	Per 100 Ft.
Boiler Tubes:	
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

St. Louis

Shipping Instructions for Pig Iron Gain

ST. LOUIS, Dec. 29.—Favorable news marked the week in pig iron. Specifications against contracts received by the St. Louis Gas & Coke Corpn. were sufficiently large to make it possible for January to be the largest month in nine months in volume of shipments. Basic users in the St. Louis industrial district placed orders for first quarter shipment for tonnages either equal to or slightly in excess of fourth quarter commitments. Southern iron now appears to be firm at $10.50, Birmingham.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., deliv'd St. Louis	19.66
Southern No. 2 fdy., deliv'd	14.92
Northern malleable, deliv'd	19.66
Northern basic, deliv'd	19.66

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Steel

The usual holiday quiet prevails in the market for finished steel. However, there seems to be a better feeling in the trade and a greater interest among buyers in the next quarter's requirements.

Old Material

Because of the holidays the scrap trade is marking time. Neither dealers nor consumers have made any purchases to speak of, although the former expect that there will be a buying movement shortly after the turn of the year. Prices are unchanged.

Railroad lists: Missouri-Kansas-

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.60c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.10c.
Galv. corrug. sheets	4.70c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

Texas, 600 tons; Missouri Pacific, 54 carloads; New York, Chicago & St. Louis, 26 carloads; St. Louis San Francisco, 20 carloads; Nashville, Chattanooga & St. Louis, 9 carloads; Louisiana & Arkansas, 7 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$10.50 to $11.00
No. 1 heavy melting or shoveling steel	9.75 to 10.25
No. 2 heavy melting or shoveling steel	9.00 to 9.50
No. 1 locomotive tires	11.00 to 11.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	11.00 to 11.50
Railroad springs	13.25 to 13.75
Bundled sheets	6.50 to 7.00
No. 2 railroad wrought	9.75 to 10.25
No. 1 busheling	7.00 to 7.50
Cast iron borings and shoveling turnings	6.00 to 6.50
Iron rails	9.50 to 10.00
Rails for rolling	11.75 to 12.25
Machine shop turnings	3.50 to 4.00
Heavy turnings	8.00 to 8.50
Steel car axles	14.50 to 15.00
Iron car axles	20.50 to 21.00
Wrot. iron bars and trans.	12.50 to 13.00
No. 1 railroad wrought	7.50 to 8.00
Steel rails, less than 3 ft.	13.00 to 13.50
Steel angle bars	10.00 to 10.50
Cast iron carwheels	11.00 to 11.50
No. 1 machinery cast	10.50 to 11.00
Railroad malleable	11.00 to 11.50
No. 1 railroad cast	10.00 to 10.50
Stove plate	8.50 to 9.00
Relay. rails, 60 lb. and under	16.00 to 16.50
Relay. rails, 70 lb. and over	20.00 to 21.00
Agricult. malleable	10.00 to 10.50

J. M. Frank, president, Ilg Electric Ventilating Co., Chicago, was elected president of the National Association of Fan Manufacturers, which comprises more than 80 per cent of the ventilating fan and blower industry, at the annual meeting in New York. Other officers elected for 1931 follow: R. E. Shaw, general sales manager of the B. F. Sturtevant Co., Boston, vice-president, and E. B. Cresap, Chicago, secretary.

PHILADELPHIA

Steel Business Quiet But Contracting Has Been Active

PHILADELPHIA, Dec. 29.—Business is almost at a standstill owing to the holiday season and year-end inventories. Current buying is limited to occasional purchases of a few tons of plates or shapes, or carload lots of foundry pig iron to carry consumers into the new year. Steel contracting for first quarter delivery has been substantial compared with that of previous quarters. Most of the important consumers of bars, plates and shapes have been protected. Mills are quoting 1.65c., Pittsburgh, on bars and 1.75c., Coatesville, Pa., on plates in small lots, and are seeking to make these prices minimum on all business placed from now on.

The Pennsylvania Railroad will allocate its 200,000 tons of rails for 1931 some time after Jan. 2. New bids are being taken on a large fabricated pipe line for Torresdale, Pa., requiring about 700 tons of plates, and eastern Pennsylvania mills are quoting the American Locomotive Co., Schenectady, N. Y., on about 1500 tons of plates for 40 locomotives to be built for the New York Central Railroad.

Pig Iron

Certain consumers have found it necessary to call for prompt delivery of carload lots of foundry iron, having reduced their stocks to such low levels for inventory that they are unable to wait for delivery after Jan. 1. Quotations on foundry grade are unchanged at $17 to $17.50 a ton, eastern Pennsylvania furnace, but, with Birmingham furnaces curtailing output and the possibility of a firmer price situation in the South, a slightly stronger market is believed to be possible in this district. A substantial tonnage of Indian pig iron has arrived at this port recently for consumers who find it desirable to mix with Southern pig iron.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$17.76 to $18.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	18.26 to 19.26
East. Pa. No. 1X	18.76 to 19.76
Basic (del'd east. Pa.)	17.75 to 18.25
Malleable	19.00 to 20.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to 24.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Old Material

In the absence of transactions, prices of all grades of scrap are unchanged. No. 1 heavy melting steel is still quotable at $11 to $11.50 a ton, delivered, based on the latest transactions with consumers, but the market lacks strength. A large user in this district has been offered No. 1 steel by dealers at $10.50 a ton, delivered.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$11.00 to $11.50
No. 2 heavy melting steel	9.50
Heavy melting steel (yard)	9.00
No. 1 railroad wrought	13.00 to 14.00
Bundled sheets (for steel works)	9.00
Hydraulic compressed, new	10.00 to 10.50
Hydraulic compressed, old	9.00 to 9.50
Machine shop turnings (for steel works)	6.50 to 7.50
Heavy axle turnings (or equiv.)	10.50 to 11.00
Cast borings (for steel works and roll. mill)	7.50
Heavy breakable cast (for steel works)	11.00 to 11.50
Railroad grate bars	9.00
Stove plate (for steel works)	9.00
No. 1 low phos., hvy., 0.04% and under	17.00 to 18.00
Couplers and knuckles	16.50 to 17.50
Rolled steel wheels	15.50 to 16.00
No. 1 blast f'nace scrap	6.50 to 7.00
Wrot. iron and soft steel pipes and tubes (new specific.)	11.50 to 12.00
Shafting	18.00
Steel axles	20.50 to 21.00
No. 1 forge fire	11.00
Cast iron carwheels	14.00 to 14.50
No. 1 cast	12.00 to 12.50
Cast borings (for chem. plant)	14.00 to 14.50
Steel rails for rolling	13.50 to 14.00

Imports

In the week ended Dec. 27, arrivals at this port consisted of 1005 tons of pig iron from British India, 70 tons of steel bars and 39 tons of steel bands from Germany and 35 tons of steel bars from Belgium.

Finished Steel

Large consumers have covered at least part of their requirements of steel bars for first quarter at 1.60c., Pittsburgh, or 1.89c., Philadelphia. Billet steel reinforcing bars continue at 1.65c. to 1.75c., Pittsburgh, or 1.94c. to 2.04c., Philadelphia. Plate mills are quoting on a fair tonnage, which is expected to be placed after the first of the year, and are trying to main-

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform.	2.50c. to 2.60c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ⅞-in. inclu.	2.90c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.60c.
†Galvanized sheets (No. 24)	4.15c.
Light plates, blue annealed (No. 10)	3.05c.
Blue ann'l'd sheets (No. 13)	3.20c.
Diam. pat. floor plates, ¼-in.	5.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 40 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

tain 1.70c., Coatesville, Pa., or 1.80½c., Philadelphia, on forward business, with 1.75c., Coatesville, Pa., or 1.85½c., Philadelphia, on small, miscellaneous orders for early shipment. Shape prices are being maintained at 1.70c., f.o.b. nearest mill to consumer, and while certain large users have been protected for the first quarter at $1 a ton lower price, sellers are not inclined to repeat such contracts. Sheet prices are unchanged at 2.35c., Pittsburgh, for black, 2.90c. to 3c., Pittsburgh, for galvanized, 2.05c., Pittsburgh, for No. 13 gage blue annealed, and 1.90c., Pittsburgh, for No. 10 gage blue annealed plates.

Boston

Year-End Pig Iron and Scrap Markets Dull

BOSTON, Dec. 29.—Business in pig iron was virtually suspended the past week. Furnace representatives expect forward buying in January.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$19.91	$20.91
*Buffalo, sil. 2.25 to 2.75	19.91	20.91
*Ala., sil. 1.75 to 2.25		21.11
*Ala., sil. 2.25 to 2.75		21.61
†Ala., sil. 1.75 to 2.25		17.25
†Ala., sil. 2.25 to 2.75		17.75

Freight rates: $4.91 all rail from Buffalo; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Cast Iron Pipe

The United States Pipe & Foundry Co. was low bidder on 1400 tons of 4 to 20-in. pipe required by Pawtucket, R. I. No other important tonnages came up for consideration during the past week. The price on 6-in. and larger pipe is holding at or close to $36 a ton, foundry. A $3 differential is asked on Class A and gas pipe.

Old Material

Little business in old material has developed during the closing days of 1930. Brokers report they have orders for No. 1 heavy melting steel and for scattered lots of other kinds of scrap, but that they are unable to pick up much material as prices are unattractive to the owners. Quotations on textile machinery cast have declined 50c. a ton.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$6.60 to	$7.10
Scrap T rails	6.60 to	7.10
Scrap girder rails	5.60 to	6.10
No. 1 railroad wrought	7.00 to	7.50
Machine shop turnings	2.00 to	2.60
Cast iron borings (steel works and rolling mill)	2.00 to	2.60
Bundled skeleton, long	5.75 to	6.10
Forge flashings	5.75 to	6.10
Blast furnace borings and turnings	2.00 to	2.10
Forge scrap	5.60 to	6.10
Shafting	12.50 to	13.50
Steel car axles	14.00 to	15.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	6.00 to	6.50
Rails for rolling	8.50 to	9.00
Cast iron borings, chemical	9.00 to	9.50
No. 2 cast	5.50 to	6.00

Prices per gross ton deliv'd consumers' yards:

Textile cast	$10.50 to	$11.00
No. 1 machinery cast	11.50 to	12.50
Stove plate	7.00 to	7.25
Railroad malleable	13.00 to	13.50

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.36½c.
Structural shapes—	
Angles and beams	3.36½c.
Tees	3.36½c.
Zees	3.36½c.
Soft steel bars, small shapes	3.26½c.
Reinforcing bars	3.11½c. to 3.26½c.
Iron bars—	
Refined	3.26½c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tire steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	3.50c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.80c.

	Per Cent Off List
Machine bolts	60 and 5
Carriage bolts	60 and 5
Lag screws	60 and 5
Hot-pressed nuts	60 and 5
Cold-punched nuts	60 and 5
Stove bolts	70 and 10

Buffalo

Steel Plant Operations Curtailed —Pig Iron and Scrap Dull

BUFFALO, Dec. 29.—Pig iron orders during the past week were the smallest of the year. Buffalo furnaces are feeling the pinch of Eastern and Southern competition on any business that is offered in the East. The Lackawanna plant of the Bethlehem Steel Co. has banked one of its two active furnaces during the holiday season.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$17.50
No. 2X fdy., sil. 2.25 to 2.75	18.00
No. 1 fdy., sil. 2.75 to 3.25	19.00
Malleable, sil. up to 2.25	18.00
Basic	17.50
Lake Superior charcoal	27.28

Finished Steel

The Lackawanna plant of the Bethlehem Steel Co. is operating seven open-hearths this week, against five a week ago, but mill operation is practically suspended during this period. The two open-hearths that have been in operation at the Donner plant of the Republic Steel Corpn. are idle. Wickwire Spencer is operating one open-hearth.

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.15c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.60c.
Bands	3.50c.
Hoops	3.90c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$2.60
Black wire, base per 100 lb.	3.20

Old Material

Suspensions are being continued by all the larger consumers, and there have been no new purchases.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:		
No. 1 heavy melting steel	$10.50 to	$11.00
No. 2 heavy melting scrap	9.00 to	9.50
Scrap rails		11.00
Hydraul. comp. sheets	9.00 to	9.50
Hand bundled sheets	8.00 to	8.50
Drop forge flashings	9.00 to	9.50
No. 1 busheling	9.00 to	9.50
Hvy. steel axle turnings	11.00 to	11.50
Machine shop turnings	5.50 to	6.00
No. 1 railroad wrought	10.00 to	10.50
Acid Open-Hearth Grades:		
Knuckles and couplers	13.00 to	13.50
Coil and leaf springs	13.00 to	13.50
Rolled steel wheels	13.00 to	13.50
Low phos. billet and bloom ends	15.00 to	15.50
Electric Furnace Grades:		
Short shov. steel turnings	8.50 to	9.00
Blast Furnace Grades:		
Short mixed borings and turnings	7.00 to	7.50
Cast iron borings	7.00 to	7.50
No. 2 busheling		6.00
Rolling Mill Grades:		
Steel car axles	15.00 to	15.50
Iron axles	16.00 to	16.50
Cupola Grades:		
No. 1 machinery cast	10.25 to	11.00
Stove plate	9.50 to	10.00
Locomotive grate bars	8.25 to	9.25
Steel rails, 3 ft. and under	15.00 to	15.50
Cast iron carwheels	13.50 to	14.00
Malleable Grades:		
Industrial	11.00 to	12.00
Railroad	11.00 to	12.00
Agricultural	11.00 to	12.00
Special Grades:		
Chemical borings	10.50 to	11.00

Pacific Coast

Fairly Good Awards of Shapes and Bars

SAN FRANCISCO, Dec. 29.—A fair tonnage in structural shapes and reinforcing bars has been placed with-

Pig iron prices per gross ton at San Francisco:

*Utah basic	$22.00 to	$24.00
*Utah fdy., sil. 2.75 to 3.25	22.00 to	24.00
**Indian fdy., sil. 2.75 to 3.25	22.00 to	24.00

*Delivered San Francisco.

**Duty paid, f.o.b. cars San Francisco.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.40c.
Black sheets (No. 24)	4.35c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.00c.
Struc. rivets, ½-in. and larger	5.00c.
Com. wire nails, base per keg	$3.35
Cement c't'd nails, 100 lb. keg	3.35

in the past week, but inquiries for steel products generally are light.

Bars

Reinforcing bar awards totaled 4000 tons, including 500 tons for the American Can Co.'s warehouse at Seattle, placed with the Northwest Steel Rolling Mill and 400 tons for highway work near Burley, Idaho, which went to an unnamed interest.

Plates

Awards of plates were all under 100 tons each. Los Angeles has opened bids on 640 tons for 51-in. welded pipe, and bids will be opened Jan. 9 on 1300 tons for a welded pipe line at Chelan, Wash.

Shapes

Structural steel awards exceeded 2100 tons, including 200 tons for the Snoqualmie River bridge in Washington, placed with the Isaacson Iron Works, and 185 tons for the Stauffer Chemical Co.'s plant at Stege, Cal., taken by the Herrick Iron Works. Bids have been opened on 1300 tons for an auditorium in Pasadena, Cal., and new bids are being taken on 4000 tons for the Ford Motor Co. plant in Seattle.

Cast Iron Pipe

The Pacific States Cast Iron Pipe Co. has booked 144 tons of 6 and 8-in. pile for The Dalles, Ore. Bremerton, Wash., has opened bids on 400 tons of 4- to 12-in. Oakland will open bids Jan. 3 on 1200 tons of 6- to 20-in., and Inglewood, Cal., has opened bids on 143 tons of 4- to 10-in.

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	3.90c.
Bands	3.35c.
Cold-fin. rounds and hex	3.80c.
Squares	4.30c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (25 kegs or more)	2.95
Cement c't'd nails, base 100 lb. keg	2.95
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

Cincinnati

Pig Iron Sales Increase; No Change in Scrap

CINCINNATI, Dec. 29.—Despite the holiday last week, sales of pig iron turned upward sharply as consumers closed on inquiries which have been pending for some time. Total sales were about 4500 tons, of which 1400 tons was silvery for shipment to two Michigan consumers. A central Ohio consumer bought 600 tons of Northern foundry iron and a Southern buyer took 200 tons. The remainder of the week's business was in small lots. A northern Ohio melter is inquiring for from 500 to 1000 tons of Northern iron.

Prices per gross ton, deliv'd Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$14.19 to $14.69
Ala. fdy., sil. 2.25 to 2.75	14.69 to 15.19
Tenn. fdy., sil. 1.75 to 2.25	14.19 to 14.69
S'th'n Ohio silvery, 8 per cent	24.39

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Old Material

The market is inactive. Prices are unchanged.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$10.00 to $10.50
Scrap rails for melting	10.50 to 11.00
Loose sheet clippings	5.50 to 6.00
Bundled sheets	8.75 to 9.25
Cast iron borings	4.00 to 4.50
Machine shop turnings	5.00 to 5.50
No. 1 busheling	8.00 to 8.50
No. 2 busheling	4.50 to 5.00
Rails for rolling	11.50 to 12.00
No. 1 locomotive tires	11.00 to 11.50
No. 2 railroad wrought	9.50 to 10.00
Short rails	14.75 to 15.25
Cast iron carwheels	10.50 to 11.00
No. 1 machinery cast	14.00 to 14.50
No. 1 railroad cast	12.00 to 12.50
Burnt cast	6.50 to 7.00
Stove plate	6.50 to 7.00
Brake shoes	6.50 to 7.00
Agricultural malleable	12.00 to 12.50
Railroad malleable	13.00 to 13.50

Birmingham

Pig Iron Demand Dull—L. & N. to Place Additional Rail Tonnage

BIRMINGHAM, Dec. 29.—The pig iron market has been dragging bottom during the holiday period. Demand for first quarter iron has been exceptionally small. Consumers have scanty stocks, but their advance orders are also lighter than usual. Eight furnaces are in blast, seven on foundry iron and one on basic iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.00
No. 1 fdy., 2.25 to 2.75 sil.	14.50
Basic	14.00

Finished Steel

Quotations on bars, plates and shapes continue to hold at 1.80c., following an advance of $1 a ton 10 days ago. The Louisville & Nashville Railroad is reported to be planning to place an order with the Ensley rail mill for a tonnage larger than the 20,000-ton order recently placed with the Gary mill. The Virginia Bridge & Iron Co. has received a contract for 1000 tons of structural steel for a bridge in the Philippines and 400 tons for a bridge on the Pacific Coast.

Cast Iron Pipe

The United States Pipe & Foundry Co. has booked 6000 tons for Detroit, the remaining 5000 tons going to two Eastern makers. The United States Pipe & Foundry Co. and James B. Clow Co. have received contracts for 1000 tons for Fort Wayne, Ind. A water works project near Oakland, Cal., will require 800 tons in early January. Minneapolis will open bids Jan. 5 on 600 tons and St. Paul is to award a like amount on about the same date. Contracts are pending on upward of 4000 tons of municipal requirements, for which bids were opened last week. The larger plants are resuming operations today after having been closed since Dec. 20.

Old Material

The scrap market is inactive. Prices are unchanged.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$10.00
Scrap steel rails	10.50
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	9.00
Steel axles	19.00
Iron axles	18.00
No. 1 railroad wrought	10.00
Rails for rolling	$11.50 to 12.00
No. 1 cast	11.00 to 11.25
Tramcar wheels	11.00 to 11.25
Cast iron borings, chem.	13.50
Cast iron carwheels	11.00

Railroad Equipment

Northern Pacific Orders 1000 Box Cars

THE Northern Pacific Railroad has ordered 1000 box cars from the Pacific Car & Foundry Co. Other news of the week follows:

Milwaukee has postponed for a month the placing of 57 locomotives, for which it recently inquired.

Union Railroad is inquiring for 20 air dump cars.

Freedom Oil Works Co. is in the market for seven tank cars.

Illinois Steel Co. is inquiring for 15 ingot cars.

Carnegie Steel Co. is inquiring for 30 70-ton hopper cars.

Fruit Growers Express has asked for bids on 50 steel underframes for refrigerator cars, in addition to 20 recently inquired for.

Sanitary District of Chicago has ordered 25 air dump cars from Western Wheeled Scraper Co.

Canadian Pacific has ordered 200 freight cars and 55 passenger cars, in addition to the 250 refrigerator cars mentioned last week as having been awarded to National Steel Car Co. The more recent orders are for 40 gondola cars and 35 air dump cars, to be built by Canadian Car & Foundry Co., and 25 tank cars to be built in railroad's own shops. Road will also build a snow plow in its shops. The passenger cars are to be built partly by Canadian Car & Foundry Co. and partly by railroad's own shops.

Fabricated Structural Steel

New Projects of 65,000 Tons Include 30,000 Tons of Bridges —Awards Only 9000 Tons

NEW projects requiring fabricated structural steel totaling 65,000 tons are the largest since the week of Dec. 11, but awards of 9000 tons were the lowest of 1930, with one exception, the week of Jan. 9, when the total was only 7000 tons. The only award larger than 1000 tons was 1900 tons for highway bridges at Kittanning, Pa.

All but about 8000 tons of new business is in three large projects—bridges on the Great Lakes to Gulf waterway, 30,000 tons, a post office in Washington, 17,000 tons, and a mill building at Indiana Harbor, Ind., for the Inland Steel Co., 10,000 tons. Awards follow:

North Atlantic States

PORTSMOUTH, N. H., 180 tons, manufacturing plant, to Palmer Steel Co.

STATE OF NEW YORK, 700 tons, highway bridges in Herkimer and Montgomery counties, to American Bridge Co.

NEW YORK, 925 tons, Earl Carroll Theater, Fiftieth Street and Seventh Avenue, to Bethlehem Steel Co.

NEW YORK, 440 tons, addition to building of New York Telephone Co. in Bronx, to Heddon Iron Construction Co.

NEW BRUNSWICK, N. J., 850 tons, gymnasium for Rutgers University, to Arthur E. Smith Co., Plainfield, N. J.

STATE OF PENNSYLVANIA, 1900 tons, highway bridge at Kittanning, Pa., to McClintic-Marshall Co.

DEWART, PA., 105 tons, bridge, to McClintic-Marshall Co.

SAFE HARBOR, PA., 600 tons, bridge for Arundel Corpn., to McClintic-Marshall Co.

The South

WHEELING, W. VA., 500 tons, cold rolling mill for Wheeling Steel Corpn., to Wheeling Structural Steel Co.

Central States

EVANSTON, ILL., 450 tons, Milwaukee Road track elevation, to Worden-Allen Co.

CLEVELAND, 500 tons, James Ford Rhodes School, to Kilroy Structural Steel Co.

Western States

UNION PACIFIC RAILROAD, 550 tons, two bridges, to McClintic-Marshall Co.

DENVER & RIO GRANDE RAILROAD, 1000 tons, bridges, to American Bridge Co.

STEGE, CAL., 185 tons, Stauffer Chemical Co., to Herrick Iron Works.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

NEW YORK, 13,300 tons, sections 10 and 11, route 108, Queens subway; Triest Contracting Corpn., general contractor. Bids have been submitted.

NEW YORK, 1300 tons, anchorage on Ward's Island for new Triborough Bridge.

SYRACUSE, N. Y., 500 tons, building for State Forestry Department.

BUFFALO, 150 tons, marine airport.

NEWARK, N. J., 2850 tons, section 3 of City Railroad subway. Bids taken.

OLD BRIDGE, N. J., 1000 tons, Stone & Webster, Inc., project.

PHILADELPHIA, 200 tons, Baltimore & Ohio Market Street subway extension.

FOREST CITY, PA., 300 tons, bridges for Erie Railroad.

WASHINGTON, 17,000 tons, Post Office.

Central States

BELLEFONTAINE, OHIO, 150 tons, junior high school.

CLEVELAND, 1000 tons, factory for General Electric Co.

INDIANA HARBOR, IND., 10,000 tons, mill buildings for Inland Steel Co.

CHICAGO, 7000 tons, Ogden Avenue viaduct; Great Lakes Dredge & Dock Co., general contractor.

CHICAGO, 300 tons, Mozart school; bids to be readvertised.

STATE OF ILLINOIS, 30,000 tons, bridges on Great Lakes to Gulf waterway.

Export

INDIA, 2000 tons, transmission towers.

Reinforcing Steel

Week Has Been Light—Lettings 1330 Tons

THE past week has been one of dullest of the year. Awards of reinforcing steel totaled only 1330 tons and no new jobs have come up for bids. The volume of lettings in December was the smallest for any month this year, totaling 11,220 tons, compared with 22,050 tons in November and 32,350 tons in October. Contracts for 43,150 tons in May were the largest for any month in 1930. Awards follow:

PORT CHESTER, N. Y., 180 tons, high school; placed by Rathgeb-Walsh, Inc., Port Chester, with Concrete Steel Co.

LONG ISLAND CITY, N. Y., 350 tons, warehouse for H. C. Bohack Co., Inc., to Carroll-McCreery Co.

(Continued on page 124)

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17 ELECTRIC LOCOMOTIVES ON ONE ASSEMBLY FLOOR

ENOUGH power to haul a loaded freight train 30 miles long—17 electric locomotives in various stages of construction in one of the Erie, Pa., shops of the General Electric Company. The two large locomotives in the foreground are for the New York Central.

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NEW YORK, 100 tons, public school No. 103, Manhattan, and Bronx continuation school, to Carroll-McCreery Co.

NEW YORK, 200 tons (wire mesh), office building for McGraw-Hill Publishing Co., to Wickwire Spencer Steel Co.

WHITE PLAINS, N. Y., 100 tons, bridge, contract No. 218, Westchester County Park Commission; placed by Bisceglia Construction Co., Harrison, N. Y., with Concrete Steel Co.

BERGEN COUNTY, N. J., 200 tons, highway route 81, section 2; placed by Joseph Kinzley Co., Hackensack, N. J., with Stulz-Sickles Co., Newark.

NEW BRUNSWICK, N. J., 100 tons, gymnasium for Rutgers College; placed by Highland Park Building Co., New Brunswick, with New Jersey Rolling Mills, Ridgefield, N. J.

ST. LOUIS, 100 tons, temple for Congregation Shaare Emeth, to Laclede Steel Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEW JERSEY, 300 tons, State highway route 10, section 1; general contract placed with Jannarone Contracting Co., Newark.

CHICAGO, 3000 tons, Ogden Avenue viaduct; Great Lakes Dredge & Dock Co., general contractor.

CHICAGO, 650 tons, International House, University of Chicago; R. F. Wilson Co., general contractor.

British Steel Men Face Permanently Lowered Export Opportunities

(By Cablegram)

LONDON, Dec. 29.

MARKETS are inactive over the holidays, and there will be no general resumption before next week. The outlook is unfavorable, although hopes are entertained that adjustments in world finance will be speedily effected, so as to allow resumption of normal trading.

But it is recognized that British steel makers are faced with an increasing determination on the part of foreign countries to develop their own industries and become independent of imports of iron and steel.

Tin plate markets are quiet, with traders awaiting further information regarding negotiations with conference and non-conference works, with reference to a possible re-introduction of a minimum price.

Clyde shipbuilding this year has consisted of 246 vessels launched, aggregating 530,000 tons, net register.

Colvilles, Ltd., has been registered, with nominal capital of £4,500,000 ($21,900,000), to take over certain assets of David Colville & Sons, Ltd., and James Dunlop & Co., Ltd., both of Glasgow.

On the Continent of Europe

Continental markets are quiet. All parties to the Continental Raw Steel Cartel have now ratified the cartel's proposals to reduce the first quarter's production by 30 per cent.

Nearly all Belgian works have agreed to a minimum price for mild steel bars of 87s. 6d., f.o.b., a metric ton (0.964c. a lb.). It is expected that this undertaking will be extended to cover other branches.

Belgian output in November included 239,000 metric tons of pig iron, 216,000 tons of raw steel and 193,000 tons of rolled steel. There were 44 furnaces blowing at the end of November.

German November output included 739,000 tons of raw steel and 523,000 tons of rolled steel.

Luxemburg output in November included 179,000 tons of pig iron and 169,000 tons of raw steel. There were 26 blast furnaces active on Nov. 30.

Russian output in October comprised 402,000 tons of pig iron, 478,000 tons of raw steel and 388,000 tons of rolled steel.

New Trade Publications

Limit and Master Switches.—General Electric Co., Schenectady, N. Y. Circulars GEA-1252 and GEA-1283 to GEA-1285, inclusive, illustrate and describe hatchway limit switches for control circuits, cam-type master switches for use on control circuits only, geared-type, cam-operated limit switches, and track-type limit switches for control circuits. All operate on a.c. and d.c. circuits.

Electric Equipment for Cranes.—General Electric Co., Schenectady, N. Y. Bulletin GEA-1210, 30 pages, attractively illustrated, describes in detail the electrification of cranes—providing power for the various motions, controlling the application of power, etc. Illustrations and descriptions include different types of bearings, motors, brakes, control equipment, etc.

Rotary Pumps.—George D. Roper Corpn., Rockford, Ill. Book of 104 pages illustrating and describing rotary pumps for hydraulic service, for transfer of power, and for circulating coolant. The rear of the book contains general information about pumps such as any layman would need. There are instructions for installing pumps, common reasons for trouble in an installation, formulas for determining size and speed of pulleys and gears, and engineering tables.

Fusion Welding.—Babcock & Wilcox Co., 85 Liberty Street, New York. Publication discussing a new method of welding which, the company states, eliminates necessity for long training or great skill of operator and produces welds equal to or better than the work metal in tensile strength, shock resistance, ductility and the ability to withstand repeated stresses. Illustrated.

Steel Highway Paneling.—Tri-Lok Co., Pittsburgh. A folder illustrating the use of interlocked flat bars as a base for concrete or other plastic material in highways or the floors of industrial plants. Sunk flush with the concrete, the paneling divides the surface into small rectangular blocks.

Cooling and Ventilation.—American Rolling Mill Co., Middletown, Ohio. This eight-page pamphlet provides a detailed description, illustrated with blueprints, of the cooling and ventilating system in the Minneapolis civic auditorium. The total air supply to the main arena is 255,000 cu. ft. per minute. Cooling is accomplished by washing the air with cold well water, reducing its temperature to 50 deg. Fahr., for which 3,000,000 gal. of water a day is required. Ingot iron was used generally in the installation.

Fluid Meters.—Bailey Meter Co., 1050 Ivanhoe Road, Cleveland. Bulletin entitled "Mechanically-Operated Fluid Meters" describes and illustrates various types of mechanically-operated meters and auxiliary equipment. Colored meter chart records showing results obtained by application of Bailey meters to various processes are included, together with sections on orifice and flow nozzle location, calibration, pulsating flow, special conditions and special applications.

Michigan Steel Merger Is Ratified

Holders of more than 85 per cent of all the outstanding shares of the Michigan Steel Corpn., at a special meeting, voted to accept the offer of National Steel Corpn. for purchase of the property and business of Michigan Steel Corpn.

Payment to Michigan Steel stockholders is to be on the basis of 50 per cent in 5 per cent 10-year debentures of National Steel, 25 per cent in cash and the remaining 25 per cent either in cash or National Steel common shares at the option of Michigan Steel stockholders.

American Society for Testing Materials announces the publication of a small booklet containing the articles and the discussions which constituted a symposium on aircraft materials at the annual meeting of the society in June, 1930.

▲▲▲ Non-Ferrous Metal Markets ▲▲▲

Copper Again Advanced—Tin Higher—Lead Firm—Zinc Stronger

NEW YORK, Dec. 29.

THE WEEK'S PRICES, CENTS PER POUND FOR EARLY DELIVERY

	Dec. 29	Dec. 27	Dec. 26	Dec. 24	Dec. 23
Lake copper, New York	10.62½	10.37½	10.37½	10.37½	10.37½
Electrolytic copper, N. Y.*	10.25	10.00	10.00	10.00	10.00
Straits tin, spot, N. Y.	26.87½	.....	26.50	26.12½	25.25
Zinc, East St. Louis	4.12½	4.10	4.10	4.07½	4.05
Zinc, New York	4.47½	4.45	4.45	4.42½	4.40
Lead, St. Louis	4.95	4.95	4.95	4.95	4.95
Lead, New York	5.10	5.10	5.10	5.10	5.10

*Refinery quotation; price ½c. higher delivered in the Connecticut Valley.

Copper

Gathering strength is the feature of the market as the year closes. Electrolytic copper was advanced again today by custom smelters from 10.25c. to 10.50c., delivered in the Connecticut Valley. Buying by foreign consumers is in sufficient volume to more than take care of the intake of these producers, and sales abroad thus far this month total about 26,000 gross tons. It is probable that the price, which today is 10.55c., will be advanced tomorrow by Copper Exporters, Inc., to 10.80c., c.i.f. usual European ports. Primary producers are out of the market. There is a little buying by domestic consumers, some of it involving February and March delivery. Most of these are well covered through the first quarter. The statistical position of the industry is strong, and December data are expected to show a substantial decrease in copper above ground and perhaps in refined stocks. Lake copper is dull and nominal at 10.50c. to 10.62½c., delivered.

Tin

Prices for Straits tin, both here and in London, are higher, due to the announced plan of the Tin Producers' Association to curtail output, including the British, Dutch and Bolivian producers. This frightened some speculators in London, and there were some purchases in the expectation of further advances. Consumers here show no interest, being well covered far into next year. Activity has been held up by the extended holidays in London, there having been only one session on Dec. 24 of the London Metal Exchange, which has been closed until today. Stocks of metal in British warehouses on Dec. 27 were 22,154 tons, a decline of 500 tons from the previous week, accounted for by a shipment of 700 tons last week to this side. Spot Straits tin today is quoted at 26.87½c., New York, an advance of 1½c. for the week. London prices are about £3 a ton higher than a week ago, with spot standard at £117 10s., future standard at £118 12s. 6d. and spot Straits at £121 10s. The Singapore price today is £123 7s. 6d., nearly £10 a ton higher than a week ago.

Lead

Buying throughout the month has been confined to carload and small lots for early delivery. Purchases for January have been small, and the strength of the market lies in probable heavier buying next week. Prices are firm and unchanged at 4.95c., St. Louis, and 5.10c., New York, the latter the contract price of the leading interest.

Zinc

Prime Western zinc has been steadily advancing during the week and is now quoted at 4.12½c. to 4.15c., East St. Louis, or 4.47½c. to 4.50c., New York. Sales are in light volume, with some producers still out of the market at these levels.

Antimony

With stocks low here and with a firm market in China, metal from that source is quoted at 7.10c. for prompt delivery, New York, duty paid, with futures at 7c.

Non-Ferrous Metals at Chicago

CHICAGO, Dec. 29.—Quotations for copper, tin and zinc are higher in a dull holiday market. The old metal market is at a standstill.

Prices per lb. in carload lots: Lake copper, 10.62½c. to 10.25c.; tin, 27.50c.; lead, 5.05c.; zinc, 4.20c.; in less-than-carload lots, antimony, 8.25c. On old metals we quote copper wire, crucible shapes and copper clips, 7.75c.; copper bottoms, 6.75c. to 7.25c.; red brass, 6.75c. to 7.25c.; yellow brass, 4.75c. to 5.25c.; lead pipe, 3.75c. to 4c.; zinc, 1.25c. to 1.50c.; pewter, No. 1, 14.75c.; tin-foil, 15.75c.; block tin, 21.75c.; aluminum, 6.25c. to 6.75c.; all being dealers' prices for less-than-carload lots.

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	17.67½c.
Copper, hot rolled, base sizes	20.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	22.25c.
Seamless Tubes—	
Brass	22.50c.
Copper	21.75c.
Brass Rods	15.87½c.
Brazed Brass Tubes	25.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	9.75c. to 10.25c.
Zinc sheets, open	10.75c. to 11.25c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	29.50c. to 30.50c.
Tin, bar	30.50c. to 31.50c.
Copper, Lake	11.50c. to 12.00c.
Copper, electrolytic	11.25c. to 11.75c.
Copper, casting	11.00c. to 11.50c.
Zinc, slab	5.75c. to 6.75c.
Lead, American pig	6.00c. to 7.00c.
Lead, bar	8.00c. to 9.00c.
Antimony, Asiatic	9.50c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	24.00c. to 25.00c.
Alum. ingots, No. 12 alloys	23.00c. to 24.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	20.00c. to 21.00c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	29.00c.
Tin, bar	31.00c.
Copper, Lake	11.63c.
Copper, electrolytic	11.63c.
Copper, casting	11.25c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig	5.75c. to 6.00c.
Lead, bar	8.50c.
Antimony, Asiatic	11.50c.
Babbitt metal, medium grade	15.25c.
Babbitt metal, high grade	33.50c.
Solder, ½ and ½	19.25c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	8.50c.	9.50c.
Copper, hvy. and wire	8.25c.	9.50c.
Copper, light and bottoms	7.25c.	8.50c.
Brass, heavy	5.00c.	6.25c.
Brass, light	4.25c.	5.25c.
Hvy. machine composition	7.25c.	8.25c.
No. 1 yel. brass turnings	5.25c.	5.75c.
No. 1 red brass or compos. turnings	7.00c.	7.75c.
Lead, heavy	4.00c.	4.50c.
Lead, tea	2.50c.	3.00c.
Zinc	2.25c.	2.75c.
Sheet aluminum	7.50c.	9.50c.
Cast aluminum	5.00c.	7.50c.

▲▲ Semi-Finished Steel, Raw Materials, Bolts and Rivets ▲▲

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$30.00 to $31.00
Rerolling, 4-in. and under 10-in., Youngstown	30.00 to 31.00
Rerolling, 4-in. and under 10-in., Cleveland	30.00 to 31.00
Rerolling, 4-in. and under 10-in., Chicago	31.00 to 32.00
Forging quality, Pittsburgh	36.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$30.00 to $31.00
Youngstown	30.00 to 31.00
Cleveland	30.00 to 31.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$30.00 to $31.00
Youngstown	30.00 to 31.00
Cleveland	30.00 to 31.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$35.00
Cleveland	35.00
Chicago	36.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	8c. to 9c.
Iron ore, low phos., Swedish, average 68% iron	11c.
Iron ore, basic Swedish, average 65% iron	9c.
Manganese ore, washed 52% manganese, from the Caucasus	26c. to 28c.
Manganese ore, Brazilian, African or Indian, basic 50%	26c. to 28c.
Tungstenore, high grade, per unit, in 60% concentrates	$12.50 to $13.00
	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3 crude, c.i.f. Atlantic seaboard	$22.00 to $24.00
	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2 delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.50
Foundry, f.o.b. Connellsville prompt	$3.25 to 4.75
Foundry, by-products, Ch'go ovens	8.00
Foundry, by-products, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.35 to $1.50
Mine run coking coal, f.o.b. W. Pa. mines	1.40 to 1.50
Gas coal, ¾-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	.65 to .75
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.15

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$80.00 to $85.00
Foreign, 80%, Atlantic or Gulf port, duty paid	

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$28.00 to $30.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

Per Gross Ton Furnace		Per Gross Ton Furnace	
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	59.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$25.00	13%	$29.00
11%	26.00	14%	31.00
12%	27.00	15%	33.00

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$21.00	11%	$24.00
7%	21.50	12%	25.00
8%	22.00	13%	27.00
9%	22.50	14%	29.00
10%	23.00	15%	31.00

Delivered prices at Chicago are about 50c. a ton below this schedule.

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.30 to $1.40
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrochromium, 2% carbon	17.00c. to 17.50c.
Ferrochromium, 1% carbon	19.00c. to 20.00c.
Ferrochromium, 0.10% carbon	24.50c. to 26.00c.
Ferrochromium, 0.06% carbon	26.50c. to 28.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50
Silico-manganese, gross ton, delivered	$135.00

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$16.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	$17.00 to 17.50
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

Per 1000 f.o.b. Works

	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

Per 1000 f.o.b. Works

Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	73
†Carriage bolts	73
Lag bolts	73
Plow bolts, Nos. 1, 2, 3 and 7 heads	73
Hot-pressed nuts, blank or tapped, square	73
Hot-pressed nuts, blank or tapped, hexagons	73
C.p.c. and t. square or hex. nuts, blank or tapped	73
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	73
Semi-finished hexagon castellated nuts, S.A.E.	73
Stove bolts in packages, P'gh.	80, 10, 10 and 5
Stove bolts in packages, Chicago.	80, 10, 10 and 5
Stove bolts in packages, Cleveland.	80, 10, 10 and 5
Stove bolts in bulk, P'gh.	80, 10, 10, 5 and 2½
Stove bolts in bulk, Chicago.	80, 10, 10, 5 and 2½
Stove bolts in bulk, Cleveland.	80, 10, 10, 5 and 2½
Tire bolts	60, 10 and 10

Discounts of 73 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.75
F.o.b. Chicago	2.85

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread.	75 and 10
Upset hex. head cap screws, U.S.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread.	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

▲▲▲ Mill Prices of Finished Iron and Steel Products ▲▲▲

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c. to 1.65c.
F.o.b. Chicago	1.70c.
Del'd Philadelphia	1.89c.
Del'd New York	1.93c.
F.o.b. Cleveland	1.60c. to 1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.75c. to 1.80c.
C.i.f. Pacific ports	2.25c.
F.o.b. San Francisco mills	2.25c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft	1.70c.
F.o.b. Birmingham, mill lengths	1.75c. to 1.80c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.50c. to 1.55c.
F.o.b. Chicago Heights mill	1.60c. to 1.65c.
Del'd Philadelphia	1.84c. to 1.89c.

Iron

Common iron, f.o.b. Chicago	1.70c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.09c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c. to 1.65c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c. to 1.80c.
Del'd Cleveland	1.78½c. to 1.83½c.
Del'd Philadelphia	1.80½c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
F.o.b. Lackawanna	1.70c.
Del'd New York	1.88c.
C.i.f. Pacific ports	2.05c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c. to 1.65c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c. to 1.80c.
F.o.b. Lackawanna	1.70c.
F.o.b Bethlehem	1.70c.
Del'd Cleveland	1.78½c. to 1.83½c.
Del'd Philadelphia	1.71c. to 1.76c.
Del'd New York	1.85½c.
C.i.f. Pacific ports	2.15c. to 2.25c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.65c. to 1.70c.
Wider than 6 in., P'gh	1.55c. to 1.60c.
6 in. and narrower, Chicago	1.75c. to 1.80c.
Wider than 6 in., Chicago	1.65c. to 1.70c.
Cooperage stock, P'gh	1.90c.
Cooperage stock, Chicago	2.00c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.00c. to 2.10c.
Bars, f.o.b. Chicago	2.00c. to 2.10c.
Bars, Cleveland	2.00c. to 2.10c.
Bars, Buffalo	2.00c. to 2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.25c. to 2.35c.
Strips, Cleveland	2.25c. to 2.35c.
Strips, deliv'd Chicago	2.53c. to 2.63c.
Strips, Worcester	2.50c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.40c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$1.90 to $2.00
Cement coated nails	1.90 to 2.00
Galvanized nails	3.95 to 4.05

	Base per Lb.
Polished staples	2.35c. to 2.45c.
Galvanized staples	2.60c. to 2.70c.
Barbed wire, galvanized	2.55c. to 2.65c.
Annealed fence wire	2.05c. to 2.15c.
Galvanized wire, No. 9	2.50c. to 2.60c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.20c. to 2.30c.
Spring wire	3.30c.

(Carload lots, Chicago district mills)

Wire nails	$1.95 to $2.05
Annealed fence wire	2.30c. to 2.40c. (lb.)
Bright hard wire to manufacturing trade	2.25c. to 2.35c.
Barbed wire, galv.	2.60c. (lb.)

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Light Plates

	Base per Lb.
No. 10, blue annealed, f.o.b. P'gh	1.90c. to 2.00c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.00c. to 2.10c.
No. 10, blue annealed, del'd Phila.	2.19c. to 2.29c.
No. 10, blue annealed, B'ham	2.05c. to 2.10c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.05c. to 2.15c.
No. 13, f.o.b. Chicago dist	2.15c. to 2.25c.
No. 13, del'd Philadelphia	2.34c. to 2.44c.
No. 13, blue annealed, B'ham	2.20c. to 2.25c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.35c. to 2.45c.
No. 24, f.o.b. Chicago dist. mill	2.45c. to 2.55c.
No. 24, del'd Philadelphia	2.64c. to 2.74c.
No. 24, f.o.b. Birmingham	2.50c. to 2.55c.

Steel Furniture Sheets

No. 24, f.o.b. P'gh	3.60c.

Galvanized

No. 24, f.o.b. Pittsburgh	2.90c. to 3.00c.
No. 24, f.o.b. Chicago dist. mill	3.00c. to 3.10c.
No. 24, del'd Cleveland	3.08½c. to 3.18½c.
No. 24, del'd Philadelphia	3.24c. to 3.29c.
No. 24, f.o.b. Birmingham	3.15c.

Continuous Mill Sheets

No. 10 gage	1.75c.
No. 13 gage	1.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.65c. to 2.70c.
No. 28, f.o.b. Chicago dist. mill	2.75c. to 2.80c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.30c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	3.35c. to 3.45c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.70c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.00
Standard cokes, f.o.b. Gary	5.10

Terne Plate

(F.o.b. Morgantown or Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.30
15-lb. coating I.C.	12.90
20-lb. coating I.C.	14.00
25-lb. coating I.C.	$15.20
30-lb. coating I.C.	16.00
40-lb. coating I.C.	17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(½% Nickel)	$0.25
2100	(1¼% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light(from rail steel), f.o.b. mill	32.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅝ in. and larger	$2.80
Spikes, ½ in. and larger	2.80
Spikes, boat and barge	$3.00
Tie plate, steel	1.95
Angle bars	2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅜	47	21½	¼ and ⅜	+11	+36
¼ to ⅜	53	27½	½	23	5
½	58	44½	¾	28	11
¾	62	50½	1 and 1¼	31	15
1 to 3	64	52½	1½ and 2	35	18

Lap Weld

2	57	45½	2	23	9
2½ to 6	61	49½	2½ to 3½	28	13
7 and 8	58	45½	4 to 6	30	17
9 and 10	56	43½	7 and 8	29	16
11 and 12	55	42½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+13	+48
¼ to ⅜	49	32½	½	23	7
½	55	44½	¾	28	12
¾	60	49⅛	1 to 2	34	18
1 to 1½	62	51½			
2 to 3	63	52½			

Lap weld, extra strong, plain ends

2	55	44½	2	29	13
2½ to 4	59	48½	2½ to 4	34	20
4½ to 6	58	47½	4½ to 6	33	19
7 to 8	54	41½	7 and 8	31	17
9 and 10	47	34½	9 to 12	21	8
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discount of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discount a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Steel Merger Enjoined

Judge Rules in Favor of C. S. Eaton in Bethlehem-Youngstown Case

THE proposed merger of the Youngstown Sheet & Tube Co. with the Bethlehem Steel Corpn. was enjoined on Dec. 29 in a decision rendered by Judge David G. Jenkins of the Common Pleas Court at Youngstown.

Suit to prevent the merger was brought by Cyrus S. Eaton of Cleveland and other minority stockholders of the Youngstown Sheet & Tube Co., whose contentions are upheld in the court's decision. The suit was started about six months ago.

Judge Jenkins ruled that the Sheet & Tube directors did not give adequate information to their stockholders after they met in April and approved the merger, also that the accountants employed to make an audit of the merging companies delivered a misleading report to stockholders, and that his study of the accounting phases "makes to my mind no definite conclusion possible that the final ratio (of exchange of stock) was adequate."

The court also said that he lacked sufficiently supported facts to pass judgment on the price involved in the merger. He said also that the Sheet & Tube directors and stockholders as well were without "any such basis for forming good judgment."

Doubt as to Adequacy of Consideration

"Indeed, to put it mildly," the decision said, "it must be frankly said that in the present state of the record grave doubt as to the adequacy of the consideration exists."

Judge Jenkins criticized the presence of Harry G. Dalton, partner of Pickands, Mather & Co. of Cleveland, at the meeting of the Sheet & Tube directors on March 12, when they ratified the merger, he being also a director of Bethlehem. Whether he voted or not on the merger contract, his presence and approval of the merger at that time "were in equity a breach of trust and against public policy." This was one of the important points of attack of the foes of the merger.

Whether the Bethlehem Steel Corpn. or the Youngstown Sheet & Tube Co. will make an appeal from the decision had not been announced when this issue of THE IRON AGE went to press. E. G. Grace, president of Bethlehem, gave out a brief statement which said that until Bethlehem had the benefit of its counsel's study of the decision, he was naturally not in a position to make any comment.

Steel Production in Germany Stops Declining

(By Radiogram)

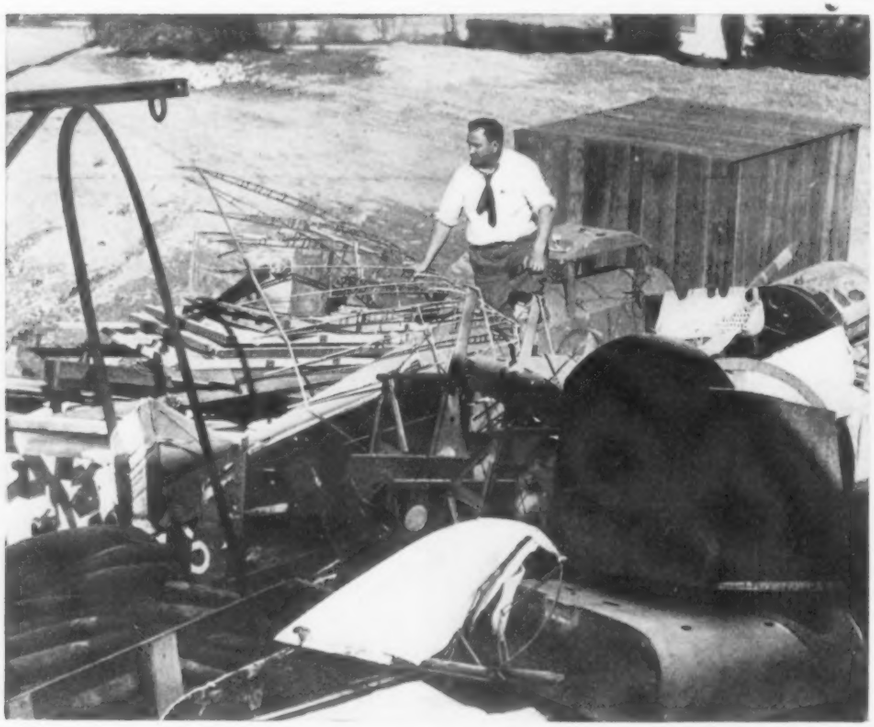
BERLIN, Dec. 29.

IMPROVEMENT in the international steel markets early in the new year is expected here. The domestic market continues dull, and the West German market is affected by increasing imports of Belgian bars and bands.

Pig iron production of Germany in the first 11 months was 26 per cent below that for the same period in 1929. Steel production was down 28 per cent, but the decline in production seems to have ceased.

Export markets are less firm than early in December, but prices are being maintained. South American orders have increased. Exports of semi-finished steel are active, and the mills have orders for a considerable time ahead.

Pig iron export markets are firmer, in consequence of improved prospects of renewal of the Franco-Belgian pig iron agreement.



A SCRAP YARD FOR OLD AIRPLANES

LOS ANGELES has a unique scrap yard—one that is maintained by A. Balboni for the receipt of worn-out or wrecked airplanes. A good deal of the material is used over again not for remelting purposes, but for tests and experimental work. Air training schools buy the old motors for demonstration in ground schools, universities use old motors and wing parts to study the effects of falls from high altitudes.

Iron and Steel Prices for Seventeen Years

Monthly Averages Computed from the Weekly Market Quotations of THE IRON AGE in the Period of 1914 to 1930

IN this issue of THE IRON AGE are our two colored price charts, in which plotted lines indicate the course of prices for pig iron, billets, scrap and leading forms of finished iron and steel and non-ferrous metals in the 17 years ended with 1930. The diagrams are based on monthly averages of prices quoted week by week in our market reports from the leading selling centers. In the tables following are the monthly average prices of about 80 products, including those on which the charts are based.

Bessemer Pig Iron at Pittsburgh, per Gross Ton (2240 lb.)

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$14.96	$14.59	$21.58	$35.95	$37.25	$33.60	$40.00	$33.96	$21.56	$29.27	$24.76	$24.64	$22.76	$21.26	$19.26	$20.01	$20.76
Feb.	15.09	14.55	21.51	35.95	37.25	33.60	42.90	31.46	21.46	29.83	25.26	24.51	22.76	20.76	19.26	20.01	20.76
March	15.09	14.55	21.75	37.70	37.25	32.54	43.40	28.16	21.46	32.02	25.14	24.66	22.76	21.16	19.26	20.14	20.76
April	14.90	14.55	21.95	42.20	36.15	29.35	43.60	26.96	22.59	32.77	24.56	22.89	21.39	21.26	19.26	20.26	20.76
May	14.90	14.59	21.95	45.15	36.15	29.35	44.03	26.16	26.36	31.87	23.89	21.76	21.14	20.96	19.06	20.76	20.76
June	14.90	14.70	21.95	54.70	36.38	29.35	44.80	24.71	26.96	30.27	22.89	20.76	20.76	20.64	18.76	20.76	20.76
July	14.90	14.95	21.95	57.45	36.60	29.35	47.15	22.84	26.77	28.46	21.96	20.76	20.39	20.26	18.76	20.76	20.36
Aug.	14.90	15.95	21.95	54.75	36.60	29.35	49.11	21.96	29.96	28.26	21.76	20.76	19.76	20.16	18.76	20.76	20.26
Sept.	14.90	16.85	22.26	48.03	36.60	29.35	50.46	21.96	35.27	28.26	21.76	21.06	20.01	19.76	18.95	20.76	20.06
Oct.	14.84	16.95	24.08	37.25	36.60	29.35	49.16	21.96	35.17	26.96	21.76	21.39	20.89	19.76	19.31	20.76	19.51
Nov.	14.59	17.51	30.15	37.25	36.60	31.26	41.10	21.96	33.52	25.26	22.13	22.64	21.66	19.76	19.95	20.76	19.26
Dec.	14.70	19.65	35.68	37.25	36.60	36.65	36.96	21.96	29.99	24.64	23.66	22.76	21.64	19.39	20.01	20.76	19.26
Aver.	*14.89*	*15.78*	*23.90*	*43.64*	*36.67*	*31.09*	*44.39*	*25.34*	*27.58*	*28.68*	*23.29*	*23.33*	*21.34*	*20.46*	*19.22*	*20.54*	*19.79*

Basic Pig Iron, f.o.b. Mahoning or Shenango Valley Furnace, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$12.50	$12.50	$17.81	$30.00	$33.00	$30.00	$37.40	$30.00	$18.15	$25.80	$21.25	$22.00	$20.00	$18.00	$17.00	$17.50	$18.50
Feb.	13.19	12.50	17.69	30.00	33.00	30.00	42.25	27.50	17.75	26.25	22.00	22.00	20.00	18.00	17.00	17.50	18.50
March	13.00	12.50	18.20	32.25	33.00	28.94	41.50	24.20	17.94	30.13	21.94	21.30	20.00	18.40	17.00	17.50	18.50
April	13.00	12.50	18.13	38.75	32.00	25.75	42.40	22.88	20.00	31.05	21.55	20.13	18.63	19.00	16.88	17.90	18.50
May	13.00	12.50	18.00	41.60	32.00	25.75	43.25	22.00	24.60	29.00	20.50	18.81	18.38	18.20	16.30	18.38	18.50
June	13.00	12.59	18.00	48.75	32.00	25.75	44.00	20.75	25.00	27.38	19.63	18.05	18.00	17.88	15.45	18.50	18.50
July	13.00	12.74	18.00	52.50	32.00	25.75	45.85	19.38	24.25	25.10	19.00	18.00	17.63	17.50	16.00	18.50	18.10
Aug.	13.00	14.06	18.00	51.20	32.00	25.75	48.10	18.20	26.60	24.75	19.00	18.00	17.50	17.30	16.00	18.50	18.00
Sept.	13.00	14.75	18.31	42.75	32.00	25.75	48.50	19.13	32.63	24.88	19.00	18.20	17.50	17.06	16.15	18.50	17.60
Oct.	12.81	15.00	19.88	33.00	33.00	25.75	43.75	19.19	30.90	23.50	19.00	18.63	18.00	17.00	17.10	18.50	17.00
Nov.	12.48	15.75	25.10	33.00	33.00	28.31	36.50	19.00	27.75	20.88	19.13	19.88	18.50	17.00	17.50	18.50	17.00
Dec.	12.50	17.50	30.00	33.00	33.00	34.25	33.00	18.63	24.81	21.00	20.90	20.00	18.50	17.00	17.50	18.50	17.00
Aver.	*12.87*	*13.74*	*19.76*	*38.90*	*32.50*	*27.65*	*42.21*	*21.74*	*24.26*	*25.81*	*20.24*	*19.59*	*18.55*	*17.70*	*16.66*	*18.19*	*17.98*

Local No. 2 Foundry Pig Iron at Chicago (at Furnace), per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$13.75	$13.00	$18.50	$30.00	$33.00	$31.00	$40.00	$31.50	$18.90	$28.90	$23.70	$24.00	$23.00	$20.88	$18.50	$20.00	$20.00
Feb.	14.00	13.00	18.50	32.00	33.00	31.00	42.25	29.00	19.00	29.75	24.50	24.00	23.00	20.25	18.50	20.00	20.00
March	14.25	12.95	18.70	36.00	33.00	29.94	43.00	25.60	20.00	31.25	24.38	23.80	23.00	20.00	18.50	20.00	19.50
April	14.25	13.00	19.00	39.25	33.00	26.75	43.00	24.00	20.50	32.00	24.10	22.50	22.00	20.00	18.50	20.00	19.40
May	14.06	13.00	19.00	43.80	33.00	26.75	43.00	22.80	22.60	32.00	22.75	21.13	21.63	20.00	18.20	20.00	19.00
June	13.69	13.00	19.00	51.00	33.00	26.75	43.40	20.75	23.25	31.25	21.25	20.30	21.10	20.00	18.00	20.00	18.39
July	13.75	13.00	19.00	55.00	33.00	26.75	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60	20.00	17.90
Aug.	13.69	13.44	18.40	55.00	33.00	26.75	46.00	19.55	28.60	27.00	20.38	20.50	21.00	19.50	17.63	20.00	17.50
Sept.	13.25	13.90	18.13	54.67	33.00	26.75	46.00	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25	20.00	17.50
Oct.	12.94	14.63	19.63	33.00	34.00	27.75	44.50	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80	20.00	17.50
Nov.	12.56	17.13	25.80	33.00	34.00	31.00	39.40	20.60	29.75	23.13	21.00	22.75	21.00	18.50	20.00	20.00	17.50
Dec.	13.00	18.10	29.50	33.00	34.00	38.75	34.50	19.63	28.00	23.00	22.50	23.00	21.00	18.50	20.00	20.00	17.50
Aver.	*13.60*	*14.01*	*20.26*	*44.31*	*33.25*	*29.16*	*42.53*	*22.93*	*24.85*	*28.16*	*22.10*	*22.09*	*21.64*	*19.68*	*18.54*	*20.00*	*18.47*

Standard Brands Eastern Pennsylvania No. 2X Foundry Pig Iron at Philadelphia, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$14.65	$14.25	$19.94	$30.10	$34.25	$36.15	$44.10	$33.34	$21.34	$29.76	$24.11	$25.01	$24.26	$22.76	$20.56	$21.76	$21.26
Feb.	14.94	14.25	20.00	31.88	34.25	36.15	45.10	31.09	21.09	30.01	24.04	25.01	24.14	22.26	21.14	21.76	21.26
March	15.00	14.25	20.05	37.31	34.25	34.39	45.53	27.59	21.26	32.30	24.16	24.21	23.36	22.26	21.26	21.89	20.76
April	15.00	14.25	20.50	41.38	34.25	31.90	46.85	26.26	23.62	32.95	23.06	22.82	23.26	22.26	21.26	22.26	20.76
May	14.81	14.25	20.50	43.60	34.25	30.70	47.10	25.71	26.09	32.76	22.67	21.51	22.89	22.26	21.26	22.26	20.39
June	14.75	14.25	19.94	48.19	34.29	29.50	47.15	25.50	27.06	30.76	21.85	21.26	22.66	22.14	21.26	22.26	20.26
July	14.75	14.31	19.75	53.13	34.40	29.08	48.15	23.55	27.92	27.68	21.26	21.26	22.26	21.51	20.86	22.16	19.96
Aug.	14.75	14.94	19.55	53.00	34.40	29.60	51.96	20.64	32.26	25.89	21.51	21.57	22.26	21.26	20.76	21.76	19.76
Sept.	14.75	16.00	19.50	51.67	34.40	30.70	53.51	21.25	34.83	26.26	21.76	21.96	22.26	20.76	21.01	21.76	19.56
Oct.	14.63	16.25	20.31	34.25	38.85	32.10	52.53	22.23	32.54	24.04	21.76	22.64	22.26	20.51	21.26	21.76	19.26
Nov.	14.50	17.12	24.90	34.25	39.15	35.35	44.99	22.74	30.39	23.01	22.64	23.64	23.56	20.26	21.64	21.76	19.01
Dec.	14.25	19.05	29.25	34.25	39.15	40.10	35.54	21.82	28.86	24.26	24.56	24.26	23.39	20.26	21.76	21.46	18.26
Aver.	*14.73*	*15.26*	*21.18*	*44.08*	*36.49*	*32.98*	*46.88*	*25.14*	*27.27*	*28.31*	*22.78*	*22.93*	*23.05*	*21.55*	*21.17*	*21.90*	*20.04*

Southern No. 2 Foundry Pig Iron at Cincinnati, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$13.88	$12.40	$17.90	$26.10	$35.90	$34.60	$41.80	$36.75	$20.70	$27.45	$25.55	$24.05	$25.69	$22.19	$19.69	$20.19	$17.69
Feb.	13.81	12.40	17.90	27.53	35.90	34.60	43.60	32.63	20.00	28.68	26.55	24.05	25.69	21.69	19.69	20.19	17.19
March	14.00	12.27	17.90	31.90	35.90	33.54	43.60	29.80	19.50	30.80	26.55	24.05	25.69	21.69	19.69	19.69	16.69
April	13.75	12.34	17.90	37.40	35.90	30.65	44.00	28.00	20.38	31.05	26.35	24.05	25.69	21.69	19.69	19.09	16.69
May	13.75	12.40	17.90	41.90	35.90	29.85	45.60	26.70	22.10	30.75	25.55	24.05	25.69	21.69	19.39	18.69	16.69
June	13.63	12.50	17.34	45.15	36.08	28.39	45.60	26.38	23.00	29.30	24.05	23.25	24.59	21.69	19.56	18.69	16.69
July	13.30	12.71	16.90	49.90	36.60	28.35	45.60	24.75	22.30	28.85	22.05	22.18	24.19	21.13	19.19	17.99	16.39
Aug.	13.25	13.71	16.70	49.90	36.60	30.40	45.78	23.50	24.35	27.68	21.55	22.55	24.19	20.94	19.39	17.57	15.82
Sept.	13.25	14.15	17.28	49.90	36.60	31.25	46.50	23.50	29.55	26.55	21.55	22.85	24.07	20.94	19.94	17.19	15.49
Oct.	12.90	14.78	18.03	49.38	37.60	31.60	46.50	23.50	30.85	24.68	21.55	23.43	23.69	20.94	19.94	17.39	15.19
Nov.	12.90	16.15	22.40	35.90	37.60	34.35	42.50	22.90	27.55	23.65	21.80	24.87	23.69	19.69	20.07	17.69	14.94
Dec.	12.50	17.10	25.90	35.90	37.60	38.60	42.50	21.75	26.93	25.05	23.85	25.49	23.69	19.69	20.19	17.69	14.39
Aver.	*13.41*	*13.58*	*18.67*	*40.07*	*36.52*	*32.16*	*44.47*	*26.68*	*23.93*	*27.87*	*24.91*	*23.74*	*24.71*	*21.16*	*19.70*	*18.51*	*16.16*

Mahoning and Shenango Valley, No. 2 Foundry Iron, at Furnace, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$12.85	$13.00	$18.50	$31.00	$33.00	$31.00	$39.40	$31.88	$19.30	$27.00	$22.50	$22.38	$20.50	$18.50	$17.25	$17.50	$18.50
Feb.	13.19	13.00	18.31	32.00	33.00	31.00	41.50	28.00	18.88	27.50	23.00	22.00	20.50	18.50	17.25	17.50	18.50
March	13.25	13.00	18.50	34.75	33.00	29.94	41.25	25.90	19.00	30.50	23.00	21.10	20.50	18.50	17.25	17.75	18.50
April	13.25	12.75	18.50	39.75	33.00	26.75	42.80	24.75	20.75	31.00	21.80	20.13	19.00	18.50	17.25	18.00	18.50
May	13.00	12.94	18.20	42.40	33.00	26.75	44.25	23.50	22.80	30.20	20.75	19.13	18.88	18.50	17.20	18.50	18.50
June	13.00	12.69	18.13	50.25	33.00	26.75	45.00	22.10	24.00	27.63	19.63	18.30	17.96	18.13	16.75	18.50	18.50
July	13.00	12.70	18.25	54.50	33.00	26.75	45.00	20.13	24.25	25.50	19.00	18.50	17.69	18.00	16.65	18.50	18.10
Aug.	13.00	13.62	18.25	53.20	33.00	26.75	47.00	19.63	32.60	24.88	19.13	18.50	17.50	17.60	16.50	18.50	18.00
Sept.	13.00	14.70	18.39	47.00	33.00	26.75	49.40	21.00	34.88	24.75	19.80	18.80	17.63	17.50	16.88	18.50	17.80
Oct.	12.90	14.87	20.00	33.00	34.00	26.75	46.50	21.00	31.80	23.60	19.50	19.13	18.50	17.50	17.10	18.50	17.13
Nov.	12.75	15.50	25.00	33.00	34.00	31.50	40.25	20.75	27.88	21.88	19.50	20.39	19.00	17.45	17.63	18.50	17.00
Dec.	12.75	18.30	30.75	33.00	34.00	36.75	36.20	20.00	25.63	22.00	21.20	20.50	18.80	17.25	17.70	18.50	17.00
Aver.	*13.00*	*13.92*	*20.07*	*40.32*	*33.25*	*28.95*	*43.21*	*23.22*	*25.23*	*26.37*	*20.73*	*19.90*	*18.87*	*18.00*	*17.12*	*18.23*	*18.00*

No. 2 Foundry Pig Iron at Buffalo (at Furnace), per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$12.85	$12.89	$18.75	$34.94	$33.00	$31.00	$40.90	$32.38	$19.44	$26.94	$22.25	$23.00	$21.00	$18.00	$16.45	$17.31	$16.88
Feb.	12.94	13.00	18.53	35.25	33.00	31.00	42.00	30.50	18.87	27.56	22.25	22.75	21.00	17.39	16.50	17.00	16.39
March	13.22	12.41	18.72	38.45	33.00	29.94	44.75	29.00	18.30	29.05	21.81	22.12	21.00	17.00	16.39	17.00	16.25
April	13.50	12.80	18.88	42.62	33.00	26.75	45.00	26.15	20.81	29.56	21.37	20.65	21.00	17.50	16.00	17.75	16.25
May	13.41	12.88	18.78	44.95	33.00	26.75	45.00	25.62	22.62	29.40	20.25	19.00	20.75	17.50	16.00	18.06	16.25
June	13.13	12.87	18.65	48.31	33.00	26.75	44.75	23.42	23.05	29.06	19.37	19.00	19.60	17.39	16.00	17.63	16.25
July	13.05	12.70	18.70	52.25	33.00	26.63	45.00	20.87	24.50	26.00	19.00	18.85	19.00	16.88	16.00	17.45	16.20
Aug.	13.25	13.85	18.63	53.00	33.00	27.77	47.75	19.50	30.70	24.95	19.19	18.72	19.00	16.10	16.13	17.63	16.00
Sept.	13.22	14.90	19.00	53.00	33.00	28.25	50.10	20.00	33.94	24.87	19.37	18.75	19.00	16.13	16.63	17.39	15.90
Oct.	12.72	15.63	20.37	33.00	34.00	28.70	47.44	20.37	31.12	23.06	19.05	19.40	19.00	16.88	17.10	17.50	15.50
Nov.	12.44	16.28	27.25	33.00	34.00	34.30	42.56	19.12	27.80	20.87	20.50	21.19	19.00	17.00	17.81	17.39	15.47
Dec.	12.95	18.13	32.75	33.00	34.00	38.25	36.60	19.30	25.50	21.56	22.62	21.50	19.00	17.00	17.66	17.00	15.23
Aver.	*13.06*	*14.03*	*20.75*	*41.81*	*33.25*	*29.67*	*44.32*	*23.85*	*24.72*	*26.07*	*20.59*	*20.41*	*19.86*	*17.06*	*16.55*	*17.26*	*16.05*

Malleable Pig Iron at Chicago, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$13.88	$13.00	$19.00	$30.94	$33.50	$31.50	$46.50	$32.00	$18.90	$28.90	$23.88	$24.00	$23.00	$20.88	$18.50	$20.00	$20.00
Feb.	13.94	13.00	19.00	31.75	33.50	31.50	42.75	29.38	19.13	29.75	24.50	24.00	23.00	20.25	18.50	20.00	20.00
March	14.25	13.00	19.40	35.40	33.50	30.44	43.50	25.80	20.00	31.25	24.38	24.00	23.00	20.00	18.50	20.00	19.50
April	14.25	13.00	19.50	39.00	33.50	27.25	43.50	24.00	20.50	32.00	24.10	22.63	22.00	20.00	18.50	20.00	19.40
May	14.06	13.00	19.50	43.60	33.50	27.25	43.50	23.00	22.60	32.00	22.75	21.25	21.42	20.00	18.22	20.00	19.00
June	13.88	13.00	19.50	50.25	33.50	27.25	43.50	21.50	23.25	31.25	21.25	20.60	21.10	20.00	18.00	20.00	18.50
July	14.00	13.00	19.50	55.00	33.50	27.25	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00	17.60	20.00	17.90
Aug.	14.00	13.44	19.00	55.00	33.50	27.25	46.50	19.60	28.60	27.00	20.38	20.50	21.00	19.50	17.63	20.00	17.50
Sept.	13.25	14.30	19.00	54.75	33.50	27.25	46.50	21.75	32.00	26.75	20.50	21.00	21.00	19.50	18.25	20.00	17.50
Oct.	13.00	15.25	19.88	33.50	34.50	28.25	45.75	21.00	31.40	25.00	20.50	21.63	21.00	19.00	18.80	20.00	17.50
Nov.	12.88	17.13	25.50	33.50	34.50	31.50	39.50	20.60	29.75	23.13	20.88	22.75	21.00	18.50	20.00	20.00	17.50
Dec.	12.90	18.20	29.50	33.50	34.50	39.50	35.00	19.63	28.00	23.00	22.62	23.00	21.00	18.50	20.00	20.00	17.50
Aver.	*13.69*	*14.11*	*20.72*	*41.35*	*33.75*	*29.68*	*43.01*	*23.11*	*24.87*	*28.16*	*22.11*	*22.15*	*21.63*	*19.68*	*18.54*	*20.00*	*18.48*

Lake Superior Charcoal Pig Iron at Chicago, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$15.25	$15.75	$19.50	$31.75	$37.50	$38.85	$48.75	$42.50	$31.10	$33.15	$29.15	$29.04	$29.04	$27.04	$27.04	$27.04	$27.04
Feb.	15.25	15.75	19.75	33.75	37.50	38.85	58.38	39.50	29.38	33.90	29.15	29.04	29.04	27.04	27.04	27.04	27.04
March	15.25	15.75	19.75	36.75	37.50	38.85	58.20	38.50	26.00	35.40	29.15	29.04	29.04	27.04	27.04	27.04	25.04
April	15.45	15.75	19.75	40.25	37.50	31.75	57.25	38.50	26.50	36.53	29.15	29.04	29.04	27.04	27.04	27.04	27.04
May	15.75	15.75	19.75	48.15	37.50	31.75	57.50	37.50	28.40	36.65	29.15	29.04	29.04	27.04	27.04	27.04	27.04
June	15.75	15.75	19.75	52.88	37.62	31.75	57.50	37.50	29.75	36.65	29.12	29.04	29.04	27.04	27.04	27.04	27.04
July	15.75	15.75	19.75	57.75	38.00	31.75	57.50	36.37	31.65	34.81	29.04	29.04	29.04	27.04	27.04	27.04	27.04
Aug.	15.75	16.00	19.75	58.00	38.00	32.25	57.70	33.60	34.05	32.04	29.04	29.04	29.04	27.04	27.04	27.04	27.04
Sept.	15.75	15.85	19.75	58.00	38.00	32.75	58.50	33.00	36.15	32.04	29.04	29.04	29.04	27.04	27.04	27.04	27.04
Oct.	15.75	15.75	20.25	37.50	38.00	33.44	58.50	31.50	36.15	29.86	29.04	29.04	27.54	27.04	27.04	27.04	27.04
Nov.	15.75	17.00	26.46	37.50	38.70	38.50	55.75	31.50	36.15	28.40	29.04	29.04	27.04	27.04	27.04	27.04	27.04
Dec.	15.75	18.65	31.75	37.50	38.70	43.00	49.13	31.50	34.65	29.15	29.04	29.04	27.04	27.04	27.04	27.04	27.04
Aver.	*15.60*	*16.13*	*21.33*	*44.15*	*37.88*	*35.29*	*56.22*	*35.96*	*31.66*	*33.22*	*29.09*	*29.04*	*28.58*	*27.04*	*27.04*	*27.04*	*26.87*

No. 2 Foundry Pig Iron at Cleveland (Delivered Consumer), per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$13.50	$13.44	$19.30	$31.10	$33.30	$31.40	$40.00	$33.40	$20.06	$27.87	$23.70	$23.87	$22.32	$19.50	$18.50	$19.50	$19.50
Feb.	13.82	13.50	19.23	32.93	33.30	31.40	41.90	30.22	20.06	29.00	24.50	23.92	22.38	19.13	18.50	19.50	19.50
March	14.25	13.47	19.05	37.06	33.30	30.58	43.15	27.80	21.55	32.15	24.50	24.47	21.81	19.90	18.50	19.50	19.50
April	14.25	13.38	19.36	40.27	33.30	27.15	43.10	26.62	20.81	32.52	24.25	22.82	20.85	19.87	18.50	19.50	19.39
May	14.38	13.38	19.45	42.90	33.30	27.15	44.53	25.50	23.75	32.21	23.25	20.87	20.00	19.50	18.50	19.50	18.50
June	14.25	13.28	19.07	50.63	33.32	27.15	44.90	24.00	24.06	30.46	21.50	20.12	19.69	19.20	18.39	19.50	18.50
July	13.75	13.20	18.79	55.80	33.40	27.15	45.20	21.31	24.75	27.44	20.25	20.00	19.50	19.00	18.00	19.50	18.00
Aug.	13.75	14.32	18.76	55.17	33.40	27.40	48.06	20.50	31.31	26.40	20.56	20.00	19.50	19.00	18.00	19.50	18.00
Sept.	13.75	15.27	18.92	53.15	33.40	27.65	49.86	20.75	35.94	25.87	20.81	20.00	19.50	19.00	18.39	19.50	17.60
Oct.	13.73	15.43	20.12	33.30	34.40	28.15	47.88	20.75	34.09	25.25	21.00	20.55	19.87	18.88	18.63	19.50	17.50
Nov.	13.51	16.61	26.20	33.30	34.40	31.90	43.46	20.56	30.47	23.35	21.31	22.32	20.60	18.50	19.50	19.50	17.50
Dec.	13.27	18.18	31.13	33.30	34.40	36.90	36.32	19.95	27.25	23.06	22.39	22.26	20.39	18.50	19.50	19.50	17.50
Aver.	*13.85*	*14.36*	*20.78*	*41.58*	*33.60*	*29.67*	*44.06*	*24.28*	*26.18*	*27.97*	*22.34*	*21.69*	*20.53*	*19.17*	*18.66*	*19.50*	*18.42*

Southern No. 2 Foundry Pig Iron at Birmingham, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$10.63	$9.50	$15.00	$23.20	$33.00	$31.00	$38.75	$32.25	$16.20	$23.25	$21.50	$20.00	$22.00	$18.50	$16.00	$16.50	$14.00
Feb.	10.56	9.50	15.00	24.63	33.00	31.00	40.00	28.13	15.00	24.38	22.50	20.00	22.00	18.00	16.00	16.50	13.50
March	10.70	9.35	15.00	29.00	33.00	29.44	40.00	25.30	15.00	26.40	22.50	20.00	22.00	18.00	16.00	16.00	13.00
April	10.50	9.44	15.00	34.50	33.00	26.75	40.50	23.50	15.88	27.00	22.30	20.00	22.00	18.00	16.00	15.40	13.00
May	10.50	9.44	15.00	39.00	33.00	26.75	42.00	22.20	17.60	26.85	21.50	20.00	22.00	18.00	15.70	15.00	13.00
June	10.35	9.65	14.50	42.25	33.00	25.25	42.00	21.88	18.38	25.75	20.00	19.60	21.20	18.00	15.88	15.00	13.00
July	10.00	9.75	14.00	47.00	33.00	25.15	42.00	20.25	18.25	25.00	18.00	18.00	21.00	17.44	15.50	14.30	12.70
Aug.	10.00	10.75	13.80	47.00	33.00	27.38	42.00	19.00	20.10	23.70	17.50	18.00	21.00	17.25	15.69	13.88	12.13
Sept.	10.00	11.50	14.38	47.00	33.00	27.95	42.00	19.00	26.00	22.75	17.50	18.50	20.75	17.25	16.25	13.50	11.80
Oct.	10.00	12.13	15.50	33.00	34.00	28.00	42.00	19.00	26.80	20.63	17.50	19.38	20.00	17.25	16.25	13.70	11.50
Nov.	10.00	13.40	20.13	33.00	34.00	30.75	38.00	18.40	23.50	19.60	17.75	21.00	20.00	16.00	16.39	14.00	11.25
Dec.	9.60	14.38	23.00	33.00	33.40	35.20	38.00	17.33	22.88	21.00	19.80	22.00	20.00	16.00	16.50	14.00	10.70
Aver.	*10.24*	*10.73*	*15.86*	*36.05*	*33.20*	*28.72*	*40.60*	*22.19*	*19.63*	*23.86*	*19.86*	*19.71*	*21.16*	*17.47*	*16.01*	*14.82*	*12.47*

THE IRON AGE Composite Iron and Steel Prices

Composite Pig Iron Price

Average of THE IRON AGE quotations on basic pig iron at Valley furnace and foundry iron at Chicago, Birmingham, Buffalo, Valley and Philadelphia. Quoted in dollars per gross ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$12.76	$12.38	$17.81	$28.88	$33.21	$31.36	$39.08	$31.18	$18.48	$26.78	$22.15	$22.44	$21.79	$19.44	$17.63	$18.43	$18.19
Feb.	13.18	12.38	17.76	29.75	33.21	31.36	42.35	28.45	18.14	27.20	22.84	22.50	21.77	19.07	17.73	18.38	18.02
March	13.16	12.34	18.06	32.18	33.21	30.10	42.17	25.18	18.35	30.11	22.81	21.99	21.65	19.03	17.73	18.36	17.75
April	13.13	12.37	18.15	38.56	32.71	27.11	42.93	23.73	20.00	30.83	22.31	20.95	20.96	19.21	17.67	18.52	17.73
May	13.06	12.37	18.08	41.87	32.71	26.91	43.64	22.78	23.35	29.74	21.40	19.85	20.69	19.09	17.45	18.70	17.60
June	12.97	12.45	17.91	47.95	32.71	26.46	44.09	21.73	23.95	28.23	20.27	19.22	20.00	18.92	17.23	18.65	17.48
July	12.92	12.55	17.79	52.11	32.73	26.37	45.44	20.22	23.86	25.96	19.31	18.96	19.51	18.56	17.10	18.48	17.16
Aug.	12.91	13.55	17.63	51.43	32.73	26.83	47.38	18.97	26.69	25.19	19.40	19.01	19.46	18.17	17.11	18.39	16.90
Sept.	12.83	14.28	17.82	46.93	32.73	27.11	47.83	19.89	31.78	25.02	19.46	19.39	19.46	18.03	17.54	18.27	16.70
Oct.	12.67	14.67	19.18	33.21	34.31	27.52	45.05	19.97	30.57	23.30	19.46	19.92	19.69	17.96	17.94	18.33	16.31
Nov.	12.42	15.82	24.36	33.21	34.36	30.34	38.65	19.79	27.82	21.40	19.79	21.16	20.13	17.59	18.46	18.36	16.21
Dec.	12.39	17.34	28.63	33.21	34.26	36.13	34.51	19.11	25.70	21.88	21.60	21.54	19.94	17.55	18.51	18.24	15.95
Aver.	*12.87*	*13.54*	*19.43*	*36.11*	*33.24*	*28.97*	*42.76*	*22.58*	*24.06*	*26.39*	*20.90*	*20.58*	*20.12*	*18.35*	*17.68*	*18.43*	*17.17*

Composite Price of Finished Steel

Average of THE IRON AGE quotations on steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets. Quoted in cents a pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	1.451	1.383	2.06	3.384	3.549	3.371	3.158	3.057	2.059	2.469	2.783	2.566	2.447	2.432	2.318	2.391	2.325
Feb.	1.477	1.395	2.203	3.501	3.549	3.371	3.486	2.918	2.007	2.605	2.782	2.546	2.428	2.378	2.361	2.391	2.307
March	1.473	1.413	2.447	3.739	3.549	3.282	3.743	2.764	2.014	2.721	2.746	2.537	2.433	2.367	2.362	2.391	2.312
April	1.446	1.437	2.611	4.110	3.549	3.031	3.842	2.737	2.075	2.814	2.692	2.503	2.439	2.360	2.359	2.412	2.259
May	1.424	1.433	2.75	4.562	3.549	3.021	3.804	2.764	2.113	2.793	2.639	2.460	2.416	2.360	2.350	2.412	2.221
June	1.399	1.444	2.689	5.004	3.549	3.021	3.756	2.643	2.148	2.789	2.610	2.440	2.420	2.369	2.341	2.412	2.207
July	1.40	1.471	2.64	5.334	3.549	3.021	3.885	2.455	2.169	2.783	2.563	2.435	2.431	2.367	2.325	2.412	2.177
Aug.	1.446	1.511	2.682	5.249	3.549	3.021	3.967	2.341	2.292	2.775	2.515	2.413	2.431	2.367	2.348	2.402	2.156
Sept.	1.47	1.559	2.765	5.049	3.549	3.004	3.956	2.248	2.419	2.775	2.487	2.397	2.439	2.356	2.348	2.394	2.146
Oct.	1.446	1.634	2.856	3.470	3.55	3.052	3.81	2.218	2.461	2.775	2.464	2.405	2.449	2.319	2.363	2.371	2.137
Nov.	1.397	1.769	3.021	3.444	3.549	3.084	3.566	2.129	2.445	2.775	2.481	2.433	2.453	2.299	2.367	2.362	2.135
Dec.	1.366	1.941	3.278	3.441	3.461	3.11	3.114	2.107	2.439	2.775	2.540	2.456	2.453	2.310	2.385	2.362	2.124
Aver.	*1.434*	*1.534*	*2.671*	*4.188*	*3.542*	*3.115*	*3.675*	*2.532*	*2.220*	*2.738*	*2.609*	*2.465*	*2.439*	*2.357*	*2.352*	*2.395*	*2.209*

Southern Ohio No. 2 Foundry Iron, Gross Ton, at Cincinnati

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$40.93	$33.78	$22.15	$29.78	$25.18	$24.27	$23.27	$21.89	$20.89	$20.39	$19.89
Feb.	44.18	32.03	22.03	30.28	26.03	24.27	22.92	21.39	20.89	20.39	19.89
March	45.18	29.93	21.38	32.68	25.78	23.87	22.89	21.26	20.89	20.39	19.89
April	46.20	28.28	22.78	33.14	25.39	23.15	21.99	21.39	20.89	20.39	19.89
May	46.80	27.03	25.28	32.23	24.39	21.77	21.76	21.19	20.89	20.09	20.64
June	46.80	25.73	25.53	30.53	22.53	21.27	20.89	20.89	20.39	19.89	20.89
July	46.80	23.93	26.40	28.71	21.58	21.27	21.29	20.76	19.89	19.89	20.89
Aug.	47.73	22.53	30.18	28.08	21.78	21.77	21.39	20.39	19.89	19.89	20.89
Sept.	48.92	23.13	34.28	27.03	22.15	21.77	21.39	20.89	18.89	19.89	20.89
Oct.	48.28	23.53	34.53	26.93	22.28	21.90	21.39	20.89	19.19	19.89	20.89
Nov.	46.28	22.73	31.83	24.78	22.90	23.27	21.89	20.89	20.27	19.89	20.89
Dec.	38.13	22.27	29.28	24.78	23.88	23.27	21.89	20.89	20.39	19.89	20.89
Aver.	*45.52*	*26.49*	*27.14*	*28.75*	*23.66*	*22.65*	*21.91*	*21.06*	*20.28*	*20.07*	*20.54*

Bessemer Pig Iron, per Gross Ton, at Valley Furnace

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$27.50	$23.00	$22.88	$21.00	$19.50	$17.50	$18.25	$19.00
Feb.	28.06	23.50	22.75	21.00	19.00	17.50	18.25	19.00
March	30.25	23.38	22.30	21.00	19.40	17.50	18.38	19.00
April	31.00	22.80	21.13	19.63	19.50	17.50	18.50	19.00
May	30.10	22.13	20.00	19.38	19.20	17.30	19.00	19.00
June	28.50	21.13	19.00	19.00	18.88	17.00	19.00	19.00
July	26.70	20.20	19.00	18.63	18.50	17.00	19.00	18.60
Aug.	26.50	20.00	19.00	18.00	18.40	17.00	19.00	18.50
Sept.	26.50	20.00	19.30	18.25	18.00	17.19	19.00	18.30
Oct.	25.20	20.00	19.63	19.13	18.00	17.55	19.00	17.75
Nov.	23.25	20.38	20.88	19.90	18.00	18.19	19.00	17.50
Dec.	22.88	21.90	21.00	19.88	17.56	18.25	19.00	17.50
Aver.	*27.20*	*21.53*	*20.57*	*19.57*	*18.66*	*17.46*	*18.78*	*18.51*

Malleable Pig Iron, per Gross Ton, f.o.b. Valley Furnace

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$27.00	$22.39	$22.39	$20.50	$18.50	$17.30	$18.00	$19.00
Feb.	27.63	23.00	22.00	20.50	18.50	17.25	18.00	19.00
March	30.50	22.50	21.50	20.50	18.50	17.25	18.25	19.00
April	31.00	22.10	20.63	19.00	18.50	17.25	18.50	19.00
May	30.20	21.00	19.25	18.88	18.50	17.25	19.00	19.00
June	28.13	19.88	18.50	18.05	18.13	17.00	19.00	19.00
July	25.40	19.00	18.50	17.75	18.00	17.00	19.00	18.60
Aug.	24.50	19.13	18.50	17.50	17.60	17.00	19.00	18.50
Sept.	24.50	19.80	18.80	17.63	17.50	17.19	19.00	18.30
Oct.	23.30	19.50	19.13	18.50	17.50	17.55	19.00	17.75
Nov.	20.88	19.75	20.38	19.00	17.50	18.19	19.00	17.50
Dec.	20.00	21.20	20.50	18.75	17.50	18.15	19.00	17.50
Aver.	*26.09*	*20.77*	*20.01*	*18.88*	*18.02*	*17.37*	*18.73*	*18.51*

Basic Pig Iron, Delivered Eastern Pennsylvania

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$27.80	$23.00	$24.25	$23.00	$21.50	$19.50	$19.75	$19.50
Feb.	28.19	22.69	23.88	23.00	21.19	19.50	19.88	19.44
March	29.56	21.81	23.55	22.10	20.85	19.50	20.25	19.06
April	30.81	21.50	22.31	21.75	20.75	19.50	20.25	18.90
May	30.60	21.00	21.13	21.75	20.75	19.10	20.25	18.75
June	28.14	21.00	21.50	21.45	20.75	19.00	20.25	18.75
July	26.60	20.20	21.50	21.00	20.75	18.95	20.20	18.45
Aug.	25.00	20.00	20.50	20.95	20.15	18.75	19.75	18.25
Sept.	25.00	20.00	20.70	20.75	20.00	18.88	19.75	18.15
Oct.	24.20	20.00	21.25	20.69	20.00	19.45	19.75	17.75
Nov.	22.88	21.13	22.39	22.60	19.60	19.75	19.75	17.75
Dec.	23.13	23.41	23.00	22.00	19.25	20.05	19.55	17.75
Aver.	*26.88*	*21.31*	*22.16*	*21.75*	*20.46*	*19.33*	*19.95*	*18.54*

Virginia No. 2X Foundry Pig Iron, Delivered Eastern Pennsylvania (Per Gross Ton)

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$32.97	$30.17	$29.67	$28.17	$27.67	$24.54	$25.79	$22.79
Feb.	33.17	30.52	29.67	28.17	26.67	24.54	25.79	22.79
March	33.79	30.67	29.67	28.17	26.67	24.54	25.67	22.79
April	34.67	30.67	29.67	28.17	27.17	24.54	25.29	22.79
May	35.07	30.67	29.17	28.17	27.17	24.54	25.29	22.79
June	33.17	30.67	29.17	28.17	27.17	24.54	24.54	22.79
July	32.27	29.87	29.17	28.17	27.17	24.54	24.54	22.79
Aug.	31.42	28.67	29.17	28.17	26.67	24.41	24.54	22.79
Sept.	30.92	28.67	28.77	28.17	25.98	24.54	24.54	22.79
Oct.	30.17	28.67	28.17	28.17	25.79	24.54	24.54	22.79
Nov.	30.17	28.67	28.17	28.17	25.79	24.60	22.79	22.79
Dec.	30.17	29.27	28.17	28.17	25.79	25.29	22.79	22.79
Aver.	*32.33*	*29.77*	*29.05*	*28.17*	*26.64*	*24.60*	*24.68*	*22.79*

Billets and Finished Steel

Bessemer Steel Billets at Pittsburgh, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$20.13	$19.25	$32.00	$63.00	$47.50	$43.50	$48.00	$43.50	$28.00	$37.30	$40.00	$37.00	$35.00	$35.00	$33.00	$33.00	$34.00
Feb.	21.00	19.50	33.50	65.00	47.50	43.50	55.25	42.25	28.00	39.63	40.00	37.00	35.00	33.00	33.00	33.25	33.00
March	21.00	19.70	42.40	66.25	47.50	42.25	60.00	38.40	28.00	44.38	40.00	36.70	35.00	34.00	33.00	34.00	33.00
April	20.80	20.00	45.00	73.75	47.50	38.50	60.00	37.50	29.50	45.00	40.00	35.50	35.00	33.25	33.00	34.80	33.00
May	20.00	20.00	45.00	86.00	47.50	38.50	60.00	37.00	34.00	44.60	38.50	35.25	35.00	33.00	33.00	36.00	32.50
June	19.50	20.50	43.50	98.75	47.50	38.50	61.00	37.00	35.00	42.63	38.00	35.00	35.00	33.00	32.25	35.25	31.00
July	19.00	21.38	41.00	100.00	47.50	38.50	62.50	32.25	35.00	42.50	38.00	35.00	35.00	33.00	32.00	35.00	31.00
Aug.	20.25	23.13	44.20	86.00	47.50	38.50	61.00	29.60	36.10	42.50	37.75	35.00	35.00	33.00	32.00	35.00	31.00
Sept.	21.00	24.10	45.00	66.25	47.50	38.50	58.74	29.00	39.50	41.88	36.40	35.00	35.00	33.00	32.00	35.00	31.00
Oct.	20.00	24.63	46.25	49.38	47.50	38.50	55.00	29.00	40.00	40.00	35.75	34.25	35.00	33.00	32.80	35.00	31.00
Nov.	19.25	26.50	52.00	47.50	47.50	41.38	49.70	29.00	37.75	40.00	35.50	34.75	35.00	33.00	33.00	35.00	31.00
Dec.	19.00	30.60	57.50	47.50	45.50	46.00	43.50	29.00	36.50	40.00	36.00	35.00	35.00	33.00	33.00	34.60	30.60
Aver.	*20.08*	*22.44*	*43.95*	*70.78*	*47.33*	*40.51*	*56.22*	*34.46*	*33.95*	*41.70*	*37.99*	*35.23*	*35.00*	*33.27*	*32.67*	*34.66*	*31.84*

Open-Hearth Steel Billets at Pittsburgh, per Gross Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$20.25	$19.25	$33.00	$ 63.00	$47.50	$43.50	$48.00	$43.50	$28.00	$37.50	$40.00	$38.00	$35.00	$35.00	$33.00	$33.00	$34.00
Feb.	21.00	19.50	34.75	65.00	47.50	43.50	55.25	41.00	28.00	39.63	40.00	38.00	35.00	33.00	33.00	33.25	33.00
March	21.00	19.70	42.60	66.25	47.50	42.25	60.00	38.50	28.00	44.39	40.00	36.70	35.00	34.00	33.00	34.00	33.00
April	20.80	20.00	45.00	73.75	47.50	38.50	60.00	37.50	29.50	45.00	40.00	35.50	35.00	33.25	33.00	34.80	33.00
May	20.00	20.00	43.40	86.00	47.50	38.50	60.00	37.00	34.00	45.00	38.50	35.25	35.00	33.00	33.00	36.00	32.50
June	19.40	20.50	41.50	98.75	47.50	38.50	61.00	37.00	35.00	42.63	38.00	35.00	35.00	33.00	32.25	35.25	31.00
July	19.00	21.88	42.75	100.00	47.50	38.50	65.00	32.25	35.00	42.50	38.00	35.00	35.00	33.00	32.00	35.00	31.00
Aug.	20.25	23.50	45.00	82.50	47.50	38.50	61.00	29.60	35.50	42.50	37.75	35.00	35.00	33.00	32.00	35.00	31.00
Sept.	21.00	24.60	45.00	66.25	47.50	38.50	58.75	29.00	39.50	41.88	36.40	35.00	35.00	33.00	32.00	35.00	31.00
Oct.	20.00	25.25	46.25	50.50	47.50	38.50	55.00	29.00	40.00	40.00	35.75	34.25	35.00	33.00	32.80	35.00	31.00
Nov.	19.25	27.25	52.00	47.50	47.50	41.39	49.70	29.00	37.75	40.00	35.50	34.75	35.00	33.00	33.00	35.00	31.00
Dec.	19.00	31.80	57.50	47.50	45.50	46.40	43.50	29.00	36.50	44.00	36.00	35.00	35.00	33.00	33.00	34.60	30.60
Aver.	*20.08*	*22.77*	*44.06*	*70.58*	*47.33*	*40.54*	*56.43*	*34.36*	*33.90*	*41.75*	*37.99*	*35.62*	*35.00*	*33.27*	*32.67*	*34.66*	*31.84*

Wire Rods at Pittsburgh

No. 5 Bessemer wire rods, per gross ton. The quotations for November and December, 1917, and all of 1918, are Government prices and apply also to open-hearth rods

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$25.50	$25.00	$43.00	$75.00	$57.00	$57.00	$60.00	$57.00	$36.00	$47.00	$51.00	$48.00	$45.00	$45.00	$41.60	$42.00	$40.00
Feb.	26.38	25.00	48.00	77.50	57.00	57.00	63.75	54.50	35.75	49.38	51.00	48.00	45.00	43.00	43.00	42.00	39.75
March	26.50	25.00	54.80	81.00	57.00	55.75	70.00	52.00	36.00	50.00	51.00	48.00	45.00	43.00	44.00	42.00	38.00
April	26.00	25.00	60.00	85.00	57.00	52.00	70.00	49.00	38.00	50.25	51.00	47.00	45.00	42.25	44.00	42.00	38.00
May	25.50	25.00	60.00	86.00	57.00	52.00	72.50	48.00	38.00	51.00	48.75	46.00	45.00	42.00	44.00	42.00	36.00
June	24.50	25.00	53.75	92.50	57.00	52.00	75.00	48.00	38.50	51.00	48.00	45.60	45.00	42.00	42.00	42.00	36.00
July	24.50	25.63	53.75	96.25	57.00	52.00	75.00	43.00	40.00	51.00	48.00	45.00	45.00	42.25	42.00	42.00	36.00
Aug.	25.00	27.00	55.00	94.00	57.00	52.00	75.00	41.80	42.40	51.00	46.50	45.00	45.00	43.00	42.00	42.00	36.00
Sept.	26.20	29.40	55.00	88.75	57.00	52.00	75.00	39.50	46.25	51.00	46.00	45.00	45.00	43.00	42.00	42.00	36.00
Oct.	25.88	31.75	55.00	77.25	57.00	52.00	75.00	40.50	45.00	51.00	45.50	45.00	45.00	42.75	42.00	40.00	36.00
Nov.	25.25	36.25	63.00	57.00	57.00	54.50	66.40	40.00	45.00	51.00	45.00	45.00	45.00	41.00	42.00	40.00	36.00
Dec.	25.00	39.50	68.75	57.00	57.00	59.50	57.00	38.00	45.00	51.00	48.00	45.00	45.00	40.00	42.00	40.00	35.20
Aver.	*25.52*	*28.29*	*55.84*	*79.77*	*57.00*	*53.98*	*69.55*	*45.94*	*40.49*	*50.39*	*48.31*	*46.05*	*45.00*	*42.44*	*42.55*	*41.50*	*36.91*

Plain Wire, Base, at Pittsburgh, Cents a Pound

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	1.51	1.37	1.55	1.35	1.34	1.98	2.95	3.25	3.25	3.25	3.25	2.25	2.45	2.75	2.60	2.50	2.49	2.40	2.50	2.40
Feb.	1.55	1.40	1.55	1.40	1.39	2.10	2.95	3.25	3.25	3.50	3.13	2.20	2.63	2.75	2.60	2.50	2.41	2.48	2.50	2.40
March	1.57	1.40	1.56	1.40	1.40	2.25	3.11	3.25	3.19	3.50	3.00	2.25	2.65	2.75	2.60	2.50	2.40	2.50	2.50	2.40
April	1.60	1.40	1.60	1.40	1.37	2.25	3.23	3.25	3.00	3.50	3.00	2.25	2.68	2.75	2.50	2.50	2.40	2.50	2.50	2.38
May	1.60	1.40	1.60	1.36	1.35	2.45	3.45	3.25	3.00	3.50	3.00	2.25	2.75	2.68	2.50	2.50	2.40	2.50	2.50	2.30
June	1.55	1.40	1.60	1.30	1.35	2.45	3.70	3.25	3.00	3.50	2.75	2.25	2.75	2.65	2.49	2.50	2.40	2.50	2.50	2.30
July	1.50	1.42	1.58	1.32	1.39	2.45	3.95	3.25	3.00	3.50	2.56	2.25	2.75	2.63	2.50	2.50	2.40	2.42	2.50	2.30
Aug.	1.50	1.46	1.48	1.36	1.43	2.53	3.95	3.25	3.00	3.69	2.50	2.29	2.75	2.56	2.50	2.50	2.40	2.40	2.43	2.30
Sept.	1.46	1.50	1.47	1.40	1.54	2.55	3.95	3.25	3.00	3.75	2.58	2.39	2.75	2.53	2.50	2.50	2.40	2.40	2.40	2.30
Oct.	1.44	1.50	1.41	1.40	1.65	2.60	3.25	3.25	3.17	3.75	2.60	2.45	2.75	2.50	2.50	2.50	2.40	2.40	2.40	2.30
Nov.	1.37	1.50	1.39	1.39	1.72	2.80	3.25	3.25	3.29	3.65	2.56	2.45	2.75	2.50	2.50	2.50	2.40	2.40	2.40	2.30
Dec.	1.34	1.53	1.35	1.31	1.89	2.95	3.25	3.25	3.21	3.25	2.44	2.45	2.75	2.60	2.50	2.50	2.40	2.48	2.40	2.22
Aver.	*1.50*	*1.44*	*1.51*	*1.37*	*1.48*	*2.47*	*3.43*	*3.25*	*3.11*	*3.53*	*2.78*	*2.31*	*2.70*	*2.64*	*2.52*	*2.50*	*2.41*	*2.45*	*2.46*	*2.33*

Wire Nails at Pittsburgh, Dollars a Keg of 100 Lb.

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$1.71	$1.57	$1.75	$1.54	$1.54	$2.13	$3.00	$3.50	$3.50	$4.50	$3.25	$2.50	$2.70	$3.00	$2.85	$2.65	$2.64	$2.54	$2.65	$2.33
Feb.	1.75	1.60	1.75	1.60	1.57	2.25	3.00	3.50	3.50	4.50	3.21	2.40	2.78	3.00	2.85	2.65	2.56	2.63	2.65	2.25
March	1.79	1.60	1.76	1.60	1.60	2.40	3.20	3.50	3.44	4.00	3.02	2.40	2.83	3.00	2.85	2.65	2.55	2.65	2.65	2.25
April	1.80	1.60	1.80	1.60	1.56	2.40	3.28	3.50	3.25	4.00	3.13	2.40	2.93	3.00	2.80	2.65	2.55	2.65	2.65	2.16
May	1.80	1.60	1.80	1.56	1.55	2.50	3.50	3.50	3.25	4.00	3.05	2.40	3.00	2.93	2.75	2.65	2.50	2.55	2.65	2.15
June	1.75	1.60	1.80	1.50	1.55	2.50	3.75	3.50	3.25	4.00	3.00	2.40	3.00	2.90	2.68	2.65	2.50	2.55	2.65	2.13
July	1.70	1.62	1.70	1.52	1.60	2.50	4.00	3.50	3.25	4.00	2.81	2.40	3.00	2.88	2.65	2.65	2.53	2.55	2.64	2.05
Aug.	1.69	1.66	1.65	1.56	1.61	2.58	4.00	3.50	3.25	4.25	2.75	2.48	3.00	2.81	2.65	2.65	2.55	2.55	2.55	2.04
Sept.	1.65	1.70	1.65	1.60	1.69	2.60	4.00	3.50	3.25	4.25	2.86	2.63	3.00	2.78	2.65	2.65	2.55	2.55	2.50	2.00
Oct.	1.64	1.70	1.63	1.60	1.80	2.63	...	3.50	3.31	4.25	2.90	2.70	3.00	2.75	2.63	2.65	2.54	2.55	2.43	1.99
Nov.	1.55	1.70	1.59	1.50	1.87	2.85	3.50	3.50	3.50	4.05	2.84	2.70	3.00	2.75	2.65	2.65	2.50	2.55	2.40	1.93
Dec.	1.53	1.72	1.55	1.51	2.04	3.00	3.50	3.50	4.12	3.25	2.69	2.70	3.00	2.85	2.65	2.65	2.50	2.63	2.40	1.90
Aver.	*1.70*	*1.64*	*1.70*	*1.56*	*1.67*	*2.53*	*3.52*	*3.50*	*3.41*	*4.09*	*2.96*	*2.51*	*2.94*	*2.89*	*2.72*	*2.65*	*2.54*	*2.58*	*2.57*	*2.10*

Steel Rails at Mill, Open-Hearth, Dollars per Gross Ton

The extra $2 a gross ton, which was for many years charged for open-hearth rails, was annulled with the rail price announced Oct. 22, 1921

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$30.00	$30.00	$30.00	$40.00	$57.00	$57.00	$47.00	$47.00	$40.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00
Feb.	30.00	30.00	30.00	40.00	57.00	57.00	47.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
March	30.00	30.00	30.00	40.00	57.00	54.50	49.50	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
April	30.00	30.00	30.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
May	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
June	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
July	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Aug.	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Sept.	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Oct.	30.00	30.00	35.00	....	57.00	47.00	57.00	45.25	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Nov.	30.00	30.00	38.00	....	57.00	47.00	57.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Dec.	30.00	30.00	40.00	....	57.00	47.00	53.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00
Aver.	*30.00*	*30.00*	*34.00*	*40.00*	*57.00*	*49.29*	*54.38*	*45.69*	*40.75*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*

Soft Steel Bars at Pittsburgh, Cents a Pound

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan. ..	1.40	1.15	1.70	1.20	1.10	2.03	3.15	2.90	2.70	2.75	2.35	1.50	2.04	2.40	2.10	2.00	1.98	1.81	1.90	1.89
Feb. ..	1.40	1.12	1.70	1.20	1.10	2.31	3.25	2.90	2.70	3.00	2.15	1.39	2.20	2.40	2.10	2.00	1.90	1.85	1.90	1.85
March..	1.40	1.10	1.85	1.20	1.15	2.65	3.63	2.90	2.61	3.63	2.00	1.39	2.39	2.40	2.10	2.00	1.90	1.85	1.90	1.85
April ..	1.40	1.16	1.84	1.15	1.20	2.88	3.75	2.90	2.35	3.75	2.05	1.50	2.50	2.29	2.05	2.00	1.89	1.85	1.95	1.79
May ..	1.37	1.20	1.70	1.14	1.20	3.00	4.00	2.90	2.35	3.63	2.10	1.58	2.40	2.24	2.00	1.95	1.85	1.85	1.95	1.75
June ..	1.25	1.20	1.60	1.11	1.21	2.75	4.25	2.90	2.35	3.50	2.05	1.70	2.40	2.20	2.00	2.00	1.81	1.85	1.95	1.73
July ..	1.23	1.25	1.50	1.12	1.25	2.63	4.50	2.90	2.35	3.50	1.84	1.70	2.40	2.15	2.00	2.00	1.80	1.85	1.95	1.65
Aug. ..	1.20	1.30	1.40	1.19	1.30	2.56	4.30	2.90	2.35	3.25	1.74	1.88	2.40	2.13	1.95	2.00	1.80	1.90	1.95	1.64
Sept. ..	1.19	1.37	1.40	1.20	1.34	2.60	4.00	2.90	2.35	3.25	1.63	2.00	2.40	2.04	1.92	2.00	1.78	1.90	1.94	1.61
Oct. ...	1.12	1.45	1.39	1.15	1.44	2.75	2.90	2.90	2.39	3.13	1.55	2.00	2.40	2.00	2.00	2.00	1.75	1.91	1.90	1.60
Nov. ..	1.08	1.55	1.29	1.10	1.62	2.83	2.90	2.90	2.69	2.87	1.50	2.00	2.40	2.03	2.00	2.00	1.77	1.94	1.90	1.60
Dec. ..	1.12	1.66	1.21	1.07	1.84	3.00	2.90	2.80	2.75	2.35	1.50	2.00	2.40	2.10	2.00	2.00	1.80	1.90	1.90	1.60
Aver.	*1.26*	*1.29*	*1.55*	*1.15*	*1.31*	*2.67*	*3.63*	*2.89*	*2.50*	*3.22*	*1.87*	*1.72*	*2.36*	*2.29*	*2.02*	*2.00*	*1.84*	*1.87*	*1.92*	*1.71*

Tank Plates at Pittsburgh, Cents a Pound

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan. ..	1.40	1.15	1.75	1.20	1.10	2.25	4.45	3.25	3.00	2.72	2.65	1.48	2.06	2.50	2.00	1.86	1.90	1.81	1.90	1.83
Feb. ..	1.40	1.11	1.71	1.20	1.10	2.56	4.88	3.25	3.00	3.50	2.33	1.39	2.23	2.45	2.00	1.80	1.86	1.85	1.90	1.80
March..	1.40	1.12	1.70	1.18	1.10	3.10	5.25	3.25	2.91	3.63	2.04	1.39	2.39	2.39	2.00	1.86	1.85	1.85	1.90	1.80
April ..	1.40	1.21	1.68	1.15	1.15	3.56	5.88	3.25	2.65	3.75	2.10	1.48	2.50	2.28	2.00	1.90	1.85	1.85	1.95	1.80
May ..	1.39	1.25	1.60	1.12	1.15	3.75	6.60	3.25	2.65	3.75	2.20	1.56	2.50	2.20	2.00	1.86	1.84	1.85	1.95	1.73
June ..	1.35	1.25	1.45	1.10	1.16	3.63	8.00	3.25	2.65	3.55	1.95	1.63	2.50	2.18	1.92	1.88	1.80	1.85	1.95	1.69
July ..	1.35	1.30	1.45	1.10	1.22	3.44	9.00	3.25	2.65	3.38	1.85	1.70	2.50	2.09	1.90	1.90	1.80	1.85	1.95	1.65
Aug. ..	1.34	1.35	1.44	1.18	1.26	3.70	8.80	3.25	2.65	3.25	1.78	1.88	2.50	1.95	1.85	1.90	1.80	1.90	1.95	1.61
Sept. ..	1.29	1.47	1.40	1.20	1.34	4.00	8.00	3.25	2.53	3.25	1.64	2.13	2.50	1.82	1.80	1.90	1.78	1.90	1.95	1.60
Oct. ..	1.17	1.53	1.36	1.14	1.44	4.00	3.25	3.25	2.61	3.09	1.60	2.11	2.50	1.80	1.80	1.90	1.75	1.90	1.94	1.60
Nov. ..	1.13	1.59	1.26	1.08	1.65	4.15	3.25	3.25	2.65	2.81	1.54	1.99	2.50	1.83	1.86	1.90	1.77	1.90	1.90	1.60
Dec. ..	1.15	1.60	1.20	1.05	2.04	4.25	3.25	3.13	2.65	2.65	1.50	1.95	2.50	1.92	1.90	1.90	1.80	1.90	1.90	1.60
Aver.	*1.31*	*1.33*	*1.50*	*1.14*	*1.31*	*3.53*	*5.88*	*3.24*	*2.72*	*3.28*	*1.93*	*1.72*	*2.43*	*2.12*	*1.91*	*1.88*	*1.82*	*1.87*	*1.93*	*1.69*

Structural Shapes at Pittsburgh, Cents a Pound

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan. ..	1.40	1.15	1.75	1.20	1.10	1.90	3.25	3.00	2.80	2.47	2.45	1.50	2.06	2.50	2.10	1.90	1.98	1.81	1.90	1.83
Feb. ..	1.40	1.11	1.71	1.20	1.10	2.06	3.25	3.00	2.80	2.70	2.26	1.39	2.20	2.50	2.10	1.90	1.90	1.85	1.90	1.80
March..	1.40	1.15	1.70	1.19	1.10	2.40	3.54	3.00	2.71	3.13	2.08	1.39	2.39	2.39	2.10	1.90	1.90	1.85	1.90	1.80
April ..	1.40	1.21	1.68	1.15	1.20	2.55	3.88	3.00	2.45	3.25	2.10	1.50	2.50	2.29	2.05	1.90	1.88	1.85	1.95	1.80
May ..	1.39	1.25	1.50	1.14	1.20	2.60	4.00	3.00	2.45	3.10	2.20	1.56	2.50	2.24	2.00	1.90	1.80	1.85	1.95	1.73
June ..	1.35	1.25	1.45	1.11	1.20	2.53	4.31	3.00	2.45	3.10	2.10	1.63	2.50	2.20	2.00	1.94	1.80	1.85	1.95	1.69
July ..	1.35	1.30	1.45	1.12	1.25	2.50	4.50	3.00	2.45	3.10	1.93	1.70	2.50	2.09	2.00	2.00	1.80	1.85	1.95	1.65
Aug. ..	1.35	1.35	1.45	1.19	1.30	2.52	4.30	3.00	2.45	3.10	1.82	1.88	2.50	2.00	1.95	2.00	1.80	1.90	1.95	1.61
Sept. ..	1.34	1.42	1.41	1.20	1.35	2.64	4.00	3.00	2.45	3.10	1.64	2.00	2.50	2.00	1.90	2.00	1.78	1.90	1.94	1.60
Oct. ..	1.21	1.48	1.37	1.15	1.44	2.75	3.00	3.00	2.45	3.05	1.60	2.00	2.50	1.93	1.90	2.00	1.75	1.90	1.90	1.60
Nov. ..	1.13	1.57	1.29	1.10	1.60	2.86	3.00	3.00	2.45	2.89	1.54	2.00	2.50	2.00	1.90	2.00	1.77	1.90	1.90	1.60
Dec. ..	1.15	1.60	1.25	1.07	1.78	3.25	3.00	2.90	2.45	2.45	1.50	2.00	2.50	2.10	1.90	2.00	1.80	1.90	1.90	1.60
Aver.	*1.32*	*1.32*	*1.50*	*1.15*	*1.31*	*2.55*	*3.67*	*2.99*	*2.53*	*2.95*	*1.94*	*1.71*	*2.43*	*2.19*	*1.99*	*1.95*	*1.83*	*1.87*	*1.92*	*1.69*

No. 28 Gage Black Sheets, at Pittsburgh, Cents a Pound

While No. 24 gage was made the base in 1926, this table has been continued at No. 28 gage, to preserve comparisons with past years.

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan. ..	2.20	1.90	2.31	1.87	1.80	2.60	4.50	5.00	4.70	4.48	4.35	3.00	3.35	3.83	3.60	3.35	3.16	3.05	3.10	2.90
Feb. ..	2.20	1.87	2.35	1.95	1.80	2.60	4.69	5.00	4.70	5.00	4.21	3.00	3.46	3.85	3.50	3.28	3.05	3.15	3.10	2.86
March..	2.20	1.80	2.35	1.95	1.80	2.71	4.94	5.00	4.61	5.50	3.88	3.00	3.71	3.78	3.44	3.25	3.00	3.14	3.10	2.90
April ..	2.20	1.86	2.35	1.91	1.80	2.85	5.75	5.00	4.35	5.50	3.88	3.11	4.00	3.71	3.35	3.25	2.99	3.05	3.10	2.80
May ..	2.20	1.90	2.30	1.85	1.79	2.89	7.00	5.00	4.35	5.50	4.00	3.15	3.88	3.60	3.20	3.18	3.11	2.96	3.10	2.80
June ..	2.00	1.90	2.27	1.81	1.75	2.90	7.88	5.00	4.35	5.50	3.80	3.15	3.85	3.53	3.15	3.10	3.25	2.90	3.10	2.80
July ..	2.00	1.95	2.25	1.80	1.75	2.90	8.50	5.00	4.35	6.75	3.31	3.15	3.81	3.46	3.13	3.10	3.25	2.87	3.10	2.74
Aug. ..	1.99	2.02	2.21	1.86	1.85	2.90	8.50	5.00	4.35	7.50	2.90	3.23	3.75	3.45	3.15	3.10	3.25	2.90	3.10	2.69
Sept. ..	1.91	2.07	2.14	1.95	1.90	2.93	8.50	5.00	4.35	7.38	2.81	3.35	3.75	3.50	3.14	3.15	3.25	2.90	3.10	2.67
Oct. ..	1.85	2.21	2.04	1.94	2.03	3.23	...	5.05	4.35	6.69	3.00	3.47	3.75	3.50	3.11	3.23	3.15	3.00	3.02	2.61
Nov. ..	1.85	2.25	1.97	1.87	2.25	3.65	5.00	5.00	4.35	5.77	2.86	3.35	3.75	3.50	3.25	3.25	3.03	3.00	3.00	2.60
Dec. ..	1.84	2.25	1.89	1.82	2.50	4.31	5.00	4.85	4.35	4.35	3.00	3.35	3.75	3.54	3.33	3.25	3.03	3.08	3.00	2.60
Aver.	*2.04*	*2.00*	*2.20*	*1.88*	*1.92*	*3.04*	*6.39*	*4.99*	*4.43*	*5.83*	*3.50*	*3.19*	*3.78*	*3.60*	*3.28*	*3.21*	*3.13*	*3.00*	*3.08*	*2.75*

Automobile Body Sheets, Base No. 22 Gage, f.o.b. Pittsburgh, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	4.35	4.70	5.35	4.75	4.50	4.18	4.00	4.10	3.90
Feb.	4.35	4.78	5.35	4.68	4.43	4.15	4.08	4.10	3.90
March ..	4.35	5.00	5.35	4.46	4.40	4.15	4.15	4.10	3.88
April ...	4.40	5.00	5.25	4.40	4.33	4.15	4.04	4.10	3.80
May	4.45	5.35	5.10	4.40	4.29	4.15	4.00	4.10	3.75
June ...	4.50	5.35	5.10	4.22	4.20	4.25	4.00	4.10	3.65
July	4.60	5.35	5.06	4.15	4.20	4.25	4.00	4.10	3.60
Aug.	4.75	5.35	4.75	4.25	4.20	4.25	4.00	4.08	3.60
Sept. ...	4.85	5.35	4.72	4.25	4.25	4.25	4.00	4.00	3.50
Oct.	4.85	5.35	4.60	4.29	4.25	4.15	4.00	4.00	3.45
Nov.	4.85	5.35	4.60	4.40	4.25	4.12	4.00	4.00	3.38
Dec.	4.70	5.35	4.75	4.50	4.25	4.00	4.08	3.98	3.30
Aver..	*4.58*	*5.19*	*5.00*	*4.39*	*4.30*	*4.17*	*4.03*	*4.06*	*3.64*

Blue Annealed Sheets, or Light Plates, No. 10 Gage, Cents a Pound at Pittsburgh

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	2.25	2.52	3.00	2.70	2.50	2.25	2.10	2.10	2.10
Feb.	2.25	2.64	3.00	2.70	2.50	2.20	2.10	2.10	2.10
March ..	2.25	2.95	2.93	2.69	2.50	2.20	2.10	2.10	2.10
April ...	2.36	3.25	2.86	2.53	2.43	2.18	2.08	2.10	2.06
May	2.40	3.20	2.80	2.40	2.40	2.22	2.00	2.13	2.00
June	2.40	3.00	2.76	2.31	2.32	2.25	2.00	2.20	2.00
July	2.40	3.00	2.68	2.30	2.30	2.25	2.00	2.14	2.00
Aug.	2.44	3.00	2.63	2.30	2.30	2.25	2.00	2.10	1.93
Sept.	2.44	3.00	2.69	2.25	2.30	2.25	2.00	2.10	1.90
Oct.	2.60	3.00	2.70	2.26	2.30	2.14	2.00	2.10	1.90
Nov.	2.55	3.00	2.70	2.40	2.30	2.10	2.00	2.10	1.90
Dec.	2.50	3.00	2.70	2.50	2.30	2.10	2.08	2.18	1.90
Aver..	*2.41*	*2.96*	*2.79*	*2.45*	*2.37*	*2.20*	*2.04*	*2.12*	*1.99*

Wrought Iron and Steel Pipe Prices

Computed from discounts as per list, with "trimmings," for carload lots; price for base size pipe, ¾ to 3-in.

Steel Pipe, per Net Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$35.20	$34.20	$41.39	$64.84	$88.92	$83.36	$80.64	$77.30	$51.87	$61.13	$70.30	$70.30	$70.30	$70.30	$68.60	$70.30	$70.30
Feb.	36.09	35.42	43.63	66.95	88.92	83.36	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30	68.60	70.30	70.30
March	36.12	36.10	47.51	72.07	88.92	81.06	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30	68.60	70.30	70.30
April	35.54	36.10	51.25	81.51	88.92	76.88	83.36	71.63	51.87	68.02	70.30	70.30	70.30	70.30	69.88	70.30	66.50
May	35.20	38.00	53.72	92.62	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50
June	35.20	38.00	53.72	95.21	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50
July	35.20	38.00	53.72	105.59	88.92	76.88	83.36	64.63	51.87	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50
Aug.	35.20	38.00	53.72	105.59	88.92	76.88	83.36	63.91	54.74	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50
Sept.	35.20	38.00	55.21	105.59	88.92	76.88	83.36	60.21	57.43	70.30	70.30	70.30	70.30	70.30	70.30	70.30	66.50
Oct.	35.20	38.00	55.58	105.59	88.92	76.88	83.36	56.50	58.74	70.30	70.30	70.30	70.30	68.54	70.30	70.30	66.50
Nov.	34.23	39.90	56.57	91.70	88.92	76.88	83.36	56.50	61.13	70.30	70.30	70.30	70.30	66.79	70.30	70.30	66.50
Dec.	34.20	39.90	61.01	88.92	88.92	76.88	83.36	53.96	61.13	70.30	70.30	70.30	70.30	66.79	70.30	70.30	66.50
Aver.	*35.32*	*37.47*	*52.25*	*81.73*	*88.92*	*78.31*	*83.13*	*66.14*	*54.69*	*68.71*	*70.30*	*70.30*	*70.30*	*69.57*	*69.84*	*70.30*	*67.45*

Wrought Iron Pipe, per Net Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$51.30	$51.30	$58.64	$83.36	$122.27	$116.71	$115.60	$135.06	$100.96	$122.56	$131.10	$131.10	$127.82	$127.82	$127.82	$118.56	$118.56
Feb.	51.30	51.30	62.16	85.48	122.27	116.71	119.49	136.16	100.96	127.82	131.10	131.10	127.82	127.82	127.82	118.56	118.56
March	51.30	51.30	66.03	90.65	122.27	114.41	119.49	136.16	100.96	127.82	131.10	127.82	127.82	127.82	127.82	118.56	118.56
April	51.30	51.30	69.78	101.89	122.27	110.22	119.49	125.66	100.96	129.02	131.10	127.82	127.82	127.82	127.82	118.56	118.56
May	51.30	53.20	72.25	113.00	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
June	51.30	53.20	72.25	114.85	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
July	51.30	53.20	72.25	122.27	122.27	110.22	119.49	111.65	100.96	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
Aug.	51.30	53.20	72.25	122.27	122.27	110.22	119.49	110.22	105.74	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
Sept.	51.30	53.20	73.13	122.27	122.27	110.22	119.49	105.59	116.33	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
Oct.	51.30	53.20	74.10	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
Nov.	51.30	55.10	75.07	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
Dec.	51.30	55.10	79.50	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82	127.82	118.56	118.56
Aver.	*51.30*	*52.88*	*70.67*	*110.24*	*122.27*	*111.65*	*119.16*	*116.55*	*107.50*	*129.67*	*131.10*	*128.37*	*127.82*	*127.82*	*127.82*	*118.56*	*118.56*

Cast Iron Pipe Prices, 1914 to 1930

At New York, 6-In. per Net Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$22.00	$20.00	$29.00	$41.50	$55.35	$65.70	$66.30	$63.30	$47.30	$54.90	$61.60	$54.60	$50.60	$48.60	$37.25	$39.60	$36.10
Feb.	22.00	20.00	29.33	41.50	55.35	62.70	70.30	63.30	47.30	56.50	61.60	54.60	50.60	48.60	37.25	39.35	38.60
March	22.00	20.00	29.75	43.10	55.35	62.70	71.30	63.30	47.68	57.75	61.60	53.00	50.60	47.20	37.25	38.60	38.75
April	22.00	21.60	30.50	50.88	55.35	57.70	73.90	63.30	48.80	58.50	61.60	52.60	50.60	47.35	36.25	37.40	39.50
May	20.88	22.00	30.50	55.50	56.60	54.45	76.30	62.05	49.60	58.50	61.60	50.85	50.60	45.80	37.60	35.85	39.90
June	20.50	22.25	30.50	60.75	61.44	52.03	76.30	54.30	50.80	61.35	61.60	50.60	50.60	44.42	37.60	35.10	39.90
July	20.50	22.50	30.50	65.50	61.75	50.46	76.30	52.30	53.50	62.30	60.60	50.60	50.60	42.75	37.60	33.20	39.30
Aug.	20.50	23.25	30.50	65.50	61.75	52.33	76.53	46.05	54.10	62.62	59.60	50.60	50.60	39.65	36.60	33.60	38.90
Sept.	20.40	24.37	30.83	65.50	61.75	54.30	77.22	46.30	54.50	63.60	56.60	50.60	49.85	37.25	35.60	33.60	38.90
Oct.	20.00	25.25	31.50	61.00	67.70	55.30	77.22	47.30	54.50	63.60	56.35	50.60	49.60	36.50	35.60	34.60	38.90
Nov.	20.00	26.50	35.50	56.50	67.70	58.30	77.22	47.30	54.50	63.60*	55.60	50.60	49.60	36.25	37.32	34.60	38.65
Dec.	20.00	27.60	41.00	56.50	67.70	61.30	68.87	47.30	54.75	63.60*	55.20	50.60	49.10	37.00	39.40	34.60	37.90
Aver.	*20.90*	*22.94*	*31.62*	*55.31*	*60.65*	*57.27*	*74.98*	*54.68*	*51.44*	*60.57*	*59.46*	*51.65*	*50.25*	*42.61*	*37.11*	*35.84*	*38.78*

*Concession of $2 to $3 per ton from this price to consumers willing to accept winter delivery.

Cast Iron Pipe, Delivered Chicago, 6-In. and Larger, per Net Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$25.00	$23.50	$29.00	$41.50	$54.30	$64.30	$67.55	$64.10	$42.50	$51.80	$56.20	$48.70	$49.20	$44.33	$35.00	$43.33	$42.20
Feb.	25.00	23.50	29.50	41.75	54.30	61.80	71.30	64.10	41.60	53.20	56.20	49.95	49.20	43.70	35.83	44.45	44.95
March	24.20	23.50	29.50	43.00	54.30	60.55	72.80	64.10	42.10	54.20	56.20	47.60	49.20	44.20	35.70	44.70	45.20
April	24.00	23.50	30.50	53.00	54.30	56.80	74.80	64.10	42.85	57.20	56.20	46.70	49.20	43.95	36.20	44.20	45.20
May	24.00	23.50	30.50	55.50	55.81	54.30	76.80	60.10	44.60	60.20	55.20	47.07	49.20	43.20	37.80	44.20	45.15
June	24.00	23.70	30.50	60.75	60.83	51.80	76.80	52.85	46.10	60.20	54.70	47.70	48.90	42.70	40.20	45.20	45.00
July	24.00	24.00	30.50	65.50	62.05	52.60	76.80	48.85	45.57	60.20	54.80	48.20	47.95	41.58	40.80	45.20	45.00
Aug.	24.00	24.00	30.50	65.50	61.80	55.30	78.18	43.20	46.40	60.20	53.45	49.20	48.30	37.40	42.20	45.20	44.75
Sept.	24.00	24.70	31.00	65.50	61.80	55.80	82.10	42.60	47.45	59.95	51.80	49.20	47.58	34.58	42.20	45.20	43.60
Oct.	24.00	25.75	31.50	53.50	66.80	59.00	83.10	42.60	51.20	57.40	49.70	49.20	47.20	34.20	43.00	43.70	44.00
Nov.	24.00	27.00	36.25	54.25	66.80	59.80	83.10	42.90	51.20	55.45	48.20	50.20	46.70	34.59	45.20	43.70	44.00
Dec.	23.50	27.77	41.00	55.21	66.80	64.40	68.60	43.10	51.20	55.20	47.60	50.20	46.70	35.08	43.10	43.70	43.60
Aver.	*24.14*	*24.54*	*31.69*	*54.58*	*59.98*	*58.04*	*76.00*	*52.72*	*46.06*	*57.10*	*53.35*	*48.66*	*48.32*	*39.95*	*39.77*	*44.39*	*44.39*

Hot-Rolled and Cold-Rolled Strip Steel

Cents a Pound, at Pittsburgh

Hot-Rolled Strip Steel

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	...	4.50	3.30	3.45	3.30	2.00	2.75	3.00	2.25	2.30	2.34	2.01	1.80	1.80
Feb.	...	4.50	3.30	4.63	3.11	1.84	2.86	3.00	2.35	2.30	2.21	2.08	1.80	1.80
March	...	4.50	3.30	5.00	2.93	1.81	3.18	2.93	2.40	2.30	2.30	2.10	1.80	1.79
April	...	4.50	3.30	5.25	2.76	1.98	3.30	2.75	2.40	2.30	2.30	2.10	1.90	1.70
May	...	4.25	3.30	5.50	2.53	2.20	3.30	2.75	2.20	2.30	2.30	1.96	1.90	1.70
June	...	3.50	3.05	5.50	2.50	2.40	3.23	2.50	2.20	2.30	2.30	1.85	1.90	1.69
July	...	3.50	3.05	5.50	2.46	2.50	3.00	2.50	2.20	2.30	2.30	1.85	1.90	1.65
Aug.	...	3.50	3.31	5.50	2.23	2.60	3.00	2.35	2.20	2.30	2.30	1.85	1.90	1.65
Sept.	...	3.50	3.30	5.50	2.00	2.75	3.00	2.25	2.20	2.30	2.30	1.85	1.90	1.65
Oct.	...	3.50	3.30	5.25	2.00	2.90	3.00	2.25	2.23	2.30	2.19	1.85	1.90	1.60
Nov.	4.50	3.50	3.30	4.70	2.00	2.83	3.00	2.25	2.30	2.30	2.19	1.88	1.90	1.58
Dec.	4.50	3.50	3.30	3.65	2.00	2.75	2.88	2.25	2.30	2.30	2.03	1.80	1.90	1.55
Aver.	...	*3.90*	*3.26*	*4.95*	*2.49*	*2.38*	*3.04*	*2.57*	*2.27*	*2.30*	*2.26*	*1.93*	*1.88*	*1.68*

Cold-Rolled Strip Steel

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	7.00	6.50	6.25	6.00	6.25	3.50	4.50	5.00	4.00	3.90	2.95	3.00	2.85	2.65
Feb.	7.25	6.50	6.25	7.00	6.06	3.50	4.69	4.75	4.00	3.90	2.80	3.00	2.85	2.65
March	7.63	6.50	6.19	7.00	5.83	3.50	5.00	4.75	4.00	3.90	2.92	3.00	2.80	2.60
April	7.31	6.50	5.65	7.75	5.54	3.61	5.25	4.75	4.00	3.79	3.00	3.00	2.75	2.55
May	7.66	6.50	5.65	8.50	4.98	3.71	5.25	4.50	3.94	3.75	3.00	3.00	2.75	2.50
June	8.63	6.50	5.65	8.50	4.88	4.00	5.19	4.50	3.53	3.72	3.19	3.00	2.75	2.45
July	9.00	6.50	5.65	8.50	4.25	4.00	5.00	4.30	3.63	3.60	3.25	2.92	2.75	2.45
Aug.	9.00	6.50	5.65	8.50	3.96	4.10	5.00	4.13	3.75	3.60	3.25	2.90	2.75	2.35
Sept.	9.00	6.50	5.65	8.50	3.78	4.25	5.00	4.00	3.75	3.50	3.25	2.72	2.75	2.35
Oct.	9.00	6.50	5.65	8.25	3.75	4.50	5.00	4.00	3.75	3.25	3.00	2.75	2.75	2.35
Nov.	6.75	6.50	5.65	8.00	3.75	4.50	4.98	4.00	3.90	3.25	3.00	2.85	2.75	2.33
Dec.	6.50	6.35	5.93	6.63	3.75	4.50	4.91	4.00	3.90	3.00	3.00	2.85	2.75	2.25
Aver.	*7.89*	*6.49*	*5.81*	*7.76*	*4.73*	*3.97*	*4.98*	*4.39*	*3.85*	*3.60*	*3.05*	*2.92*	*2.77*	*2.46*

Nine Years of Finished Iron and Steel, Chicago and Pittsburgh

Sheets, Bars and Beams at Chicago—Rivets, Cotton Ties and Cold-Finished Bars at Pittsburgh

Black Sheets, No. 28 Gage, at Chicago District Mill, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	3.38	3.69	4.17	3.75	3.50	3.45	3.28	3.25	3.10
Feb.	3.38	3.69	4.19	3.75	3.50	3.23	3.30	3.25	3.05
March	3.38	3.90	4.14	3.75	3.50	3.25	3.30	3.35	3.05
April	3.46	4.25	4.03	3.65	3.48	3.25	3.26	3.35	2.95
May	3.53	4.19	3.99	3.48	3.40	3.37	3.12	3.35	2.95
June	3.53	4.19	3.99	3.32	3.31	3.40	3.08	3.35	2.95
July	3.49	4.19	3.84	3.35	3.30	3.40	3.05	3.35	2.94
Aug.	3.57	4.19	3.84	3.35	3.30	3.40	3.05	3.30	2.80
Sept.	3.69	4.12	3.93	3.35	3.33	3.40	3.05	3.25	2.77
Oct.	3.69	4.09	3.65	3.31	3.43	3.30	3.11	3.25	2.78
Nov.	3.69	4.09	3.68	3.43	3.50	3.19	3.15	3.13	2.70
Dec.	3.69	4.09	3.75	3.50	3.50	3.15	3.18	3.05	2.70
Aver.	*3.54*	*4.06*	*3.93*	*3.50*	*3.42*	*3.32*	*3.16*	*3.27*	*2.90*

Galvanized Steel Sheets, No. 28 Gage, at Chicago District Mill, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	4.38	4.69	5.34	4.90	4.75	4.53	4.38	4.25	4.10
Feb.	4.38	4.69	5.34	4.90	4.75	4.40	4.40	4.25	3.90
March	4.38	5.02	5.29	4.88	4.75	4.40	4.40	4.35	3.90
April	4.46	5.28	5.21	4.75	4.75	4.40	4.36	4.35	3.90
May	4.53	5.34	5.12	4.55	4.68	4.48	4.25	4.35	3.83
June	4.53	5.34	5.14	4.39	4.55	4.50	4.20	4.35	3.79
July	4.49	5.34	5.00	4.38	4.45	4.50	4.15	4.35	3.75
Aug.	4.67	5.34	4.94	4.39	4.45	4.50	4.15	4.20	3.68
Sept.	4.69	5.34	5.00	4.40	4.44	4.50	4.15	4.15	3.60
Oct.	4.69	5.34	4.75	4.41	4.54	4.45	4.15	4.15	3.60
Nov.	4.69	5.22	4.79	4.68	4.60	4.35	4.15	4.10	3.60
Dec.	4.69	5.24	4.90	4.75	4.60	4.20	4.18	4.00	3.54
Aver.	*4.54*	*5.18*	*5.07*	*4.62*	*4.61*	*4.43*	*4.24*	*4.24*	*3.77*

Blue Annealed Sheets, Nos. 9 and 10 Gage, at Chicago District Mill, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	2.63	2.84	3.34	2.85	2.65	2.56	2.24	2.25	2.30
Feb.	2.63	2.84	3.34	2.85	2.65	2.36	2.25	2.25	2.25
March	2.63	3.03	3.29	2.83	2.65	2.39	2.25	2.35	2.25
April	2.71	3.32	3.21	2.75	2.65	2.40	2.24	2.35	2.25
May	2.78	3.34	3.14	2.55	2.65	2.40	2.20	2.35	2.23
June	2.78	3.34	3.14	2.44	2.49	2.40	2.18	2.50	2.15
July	2.74	3.34	3.07	2.48	2.45	2.40	2.15	2.50	2.15
Aug.	2.78	3.34	3.04	2.45	2.45	2.40	2.15	2.35	2.10
Sept.	2.84	3.34	3.10	2.45	2.45	2.40	2.15	2.35	2.10
Oct.	2.84	3.34	2.85	2.45	2.53	2.38	2.15	2.35	2.10
Nov.	2.84	3.34	2.85	2.58	2.55	2.27	2.15	2.35	2.03
Dec.	2.84	3.34	2.85	2.65	2.55	2.15	2.18	2.30	2.00
Aver.	*2.75*	*3.23*	*3.10*	*2.61*	*2.56*	*2.38*	*2.19*	*2.35*	*2.16*

Rail Steel Bars at Chicago District Mill, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	1.56	2.00	2.30	2.03	2.00	1.90	1.80	1.90	1.88
Feb.	1.50	2.10	2.30	2.10	2.00	1.90	1.80	1.95	1.80
March	1.50	2.28	2.30	2.10	2.00	1.90	1.80	1.95	1.85
April	1.55	2.33	2.30	2.10	2.00	1.90	1.83	1.95	1.81
May	1.60	2.30	2.20	2.10	1.98	1.90	1.85	1.95	1.80
June	1.63	2.28	2.15	2.02	1.96	1.90	1.86	1.95	1.75
July	1.70	2.30	2.10	2.00	1.98	1.90	1.85	1.95	1.75
Aug.	1.89	2.30	2.05	2.00	2.00	1.90	1.85	1.95	1.65
Sept.	2.00	2.30	2.00	2.00	2.00	1.90	1.85	1.95	1.65
Oct.	2.00	2.30	2.00	2.00	2.00	1.83	1.95	1.95	1.65
Nov.	2.00	2.30	2.00	2.00	1.96	1.80	1.95	1.94	1.64
Dec.	2.00	2.30	2.00	2.00	1.90	1.80	1.95	1.90	1.60
Aver.	*1.75*	*2.25*	*2.14*	*2.04*	*1.98*	*1.88*	*1.86*	*1.94*	*1.74*

Cotton Tie Prices for Twenty-Four Years

(Per Bundle of 45-Lb., f.o.b. Pittsburgh)

1905	$0.85	1914	$0.65	1923	$1.60
1906	0.85	1915	0.85	1924	*1.40
1907	0.95	1916	1.35	1925	†1.25
1908	0.85	1917	2.10	1926	‡1.20
1909	0.70	1918	2.10	1927	**1.20
1910	0.75	1919	1.70	1928	(a)1.27
1911	0.75	1920	2.00	1929	*1.05
1912	0.70	1921	1.30	1930	*0.87
1913	0.80	1922	1.10		

*F.o.b. Atlantic and Gulf ports.
†F.o.b. Gulf ports; $1.28, f.o.b. Atlantic ports.
‡F.o.b. Gulf ports; $1.22, f.o.b. Atlantic ports.
**F.o.b. Gulf ports; $1.21, f.o.b. Atlantic ports.
(a) In lots of 2000 bundles, $1.25; larger lots, $1.23.

Common Bar Iron at Chicago, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	1.60	2.35	2.40	2.00	2.00	2.00	1.90	2.00	1.98
Feb.	1.58	2.46	2.40	2.03	2.00	2.00	1.93	2.00	1.95
March	1.58	2.53	2.40	2.10	2.00	2.00	2.00	2.04	1.95
April	1.63	2.60	2.35	2.10	2.00	2.00	2.00	2.05	1.92
May	1.67	2.60	2.28	2.08	2.00	2.00	2.00	2.05	1.90
June	1.74	2.55	2.23	2.01	2.00	2.00	2.00	2.05	1.90
July	1.85	2.50	2.20	1.96	2.00	2.00	2.00	2.05	1.90
Aug.	2.11	2.40	2.18	1.90	2.00	2.00	2.00	2.05	1.75
Sept.	2.25	2.39	2.14	1.90	2.00	1.98	2.00	2.05	1.74
Oct.	2.50	2.38	2.10	1.90	2.00	1.88	2.00	2.04	1.70
Nov.	2.50	2.40	2.08	1.94	2.00	1.88	2.00	2.00	1.70
Dec.	2.35	2.40	2.01	2.00	2.00	1.90	2.00	2.00	1.70
Aver.	*1.95*	*2.47*	*2.23*	*1.99*	*2.00*	*1.97*	*1.99*	*2.03*	*1.84*

Soft Steel Bars at Chicago, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	1.60	2.08	2.50	2.13	2.10	2.10	1.91	2.00	1.99
Feb.	1.53	2.21	2.50	2.20	2.10	2.03	1.95	2.01	1.95
March	1.55	2.45	2.50	2.20	2.10	2.00	1.98	2.05	1.95
April	1.60	2.84	2.38	2.15	2.10	2.00	2.00	2.05	1.91
May	1.66	2.74	2.30	2.10	2.10	2.00	2.00	2.05	1.85
June	1.75	2.60	2.25	2.10	2.10	2.00	2.00	2.05	1.83
July	1.75	2.60	2.19	2.10	2.10	2.00	2.00	2.05	1.75
Aug.	2.05	2.60	2.13	2.10	2.10	1.98	2.00	2.05	1.75
Sept.	2.10	2.50	2.02	2.10	2.10	1.90	2.00	2.05	1.71
Oct.	2.10	2.50	2.00	2.10	2.10	1.85	2.00	2.03	1.70
Nov.	2.10	2.50	2.05	2.10	2.10	1.87	2.00	2.00	1.70
Dec.	2.10	2.50	2.10	2.10	2.10	1.90	2.00	2.00	1.70
Aver.	*1.83*	*2.51*	*2.24*	*2.12*	*2.10*	*1.97*	*1.99*	*2.03*	*1.82*

Structural Steel Beams at Chicago, Cents a Pound

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	1.60	2.18	2.60	2.23	2.10	2.10	1.91	2.00	1.99
Feb.	1.53	2.31	2.60	2.30	2.10	2.03	1.95	2.01	1.95
March	1.55	2.52	2.60	2.30	2.10	2.00	1.98	2.05	1.94
April	1.60	2.84	2.50	2.25	2.10	2.00	2.00	2.05	1.90
May	1.66	2.84	2.45	2.20	2.10	2.00	2.00	2.05	1.83
June	1.75	2.70	2.39	2.18	2.10	2.00	2.00	2.05	1.79
July	1.75	2.70	2.27	2.10	2.10	2.00	2.00	2.05	1.75
Aug.	2.05	2.70	2.20	2.10	2.10	1.94	2.00	2.05	1.75
Sept.	2.20	2.60	2.06	2.10	2.10	1.90	2.00	2.05	1.71
Oct.	2.20	2.60	2.00	2.10	2.10	1.85	2.00	2.03	1.70
Nov.	2.20	2.60	2.15	2.10	2.10	1.87	2.00	2.00	1.70
Dec.	2.20	2.60	2.20	2.10	2.10	1.90	2.00	2.00	1.70
Aver.	*1.86*	*2.59*	*2.33*	*2.17*	*2.10*	*1.97*	*1.99*	*2.03*	*1.81*

Cold-Finished Steel Bars, Base per 100 Pounds, f.o.b. Pittsburgh

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$1.94	$2.53	$3.00	$2.80	$2.50	$2.30	$2.20	$2.20	$2.15
Feb.	1.90	2.73	2.95	2.80	2.50	2.30	2.20	2.20	2.10
March	1.80	2.85	2.98	2.72	2.50	2.38	2.20	2.20	2.10
April	1.85	3.00	3.00	2.70	2.50	2.40	2.20	2.30	2.10
May	1.94	3.25	2.90	2.70	2.50	2.40	2.20	2.30	2.10
June	2.03	3.25	2.90	2.60	2.50	2.33	2.20	2.30	2.10
July	2.10	3.25	2.84	2.60	2.50	2.20	2.10	2.30	2.10
Aug.	2.23	3.25	2.80	2.50	2.50	2.20	2.10	2.30	2.10
Sept.	2.50	3.25	2.74	2.46	2.50	2.15	2.10	2.30	2.10
Oct.	2.50	3.10	2.70	2.40	2.40	2.10	2.16	2.30	2.10
Nov.	2.50	2.95	2.70	2.48	2.30	2.10	2.20	2.30	2.00
Dec.	2.50	3.00	2.78	2.50	2.30	2.10	2.20	2.30	2.00
Aver.	*2.15*	*3.03*	*2.86*	*2.61*	*2.46*	*2.25*	*2.17*	*2.28*	*2.09*

Large Structural Rivets, Base per 100 Pounds, f.o.b. Pittsburgh

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$2.25	$3.00	$2.50	$2.60	$2.60	$2.34	$2.75	$2.90	$3.10
Feb.	2.18	3.00	2.75	2.60	2.53	2.30	2.75	2.90	3.10
March	2.00	3.25	2.75	2.60	2.50	2.30	2.90	2.90	3.10
April	2.10	3.25	2.65	2.58	2.50	2.75	2.90	3.06	3.10
May	2.24	3.25	2.65	2.45	2.50	2.75	2.90	3.10	2.95
June	2.36	3.25	2.61	2.40	2.50	2.75	2.90	3.10	2.90
July	2.46	3.13	2.60	2.40	2.50	2.75	2.90	3.10	2.90
Aug.	2.65	3.00	2.55	2.40	2.50	2.75	2.90	3.10	2.79
Sept.	3.00	2.95	2.60	2.40	2.48	2.75	2.90	3.10	2.75
Oct.	3.12	2.75	2.58	2.40	2.45	2.75	2.90	3.10	2.75
Nov.	3.10	2.68	2.60	2.60	2.45	3.00	2.90	3.10	2.75
Dec.	3.00	2.90	2.60	2.60	2.40	2.75	2.90	3.10	2.75
Aver.	*2.55*	*3.02*	*2.65*	*2.50*	*2.50*	*2.66*	*2.88*	*3.05*	*2.91*

Monthly Averages of Ferroalloy Quotations

Ferromanganese (80 Per Cent) Prices in Dollars per Gross Ton, at Seaboard

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$44.40	$68.00	$150.00	$175.00	$250.00	$255.00	$146.00	$112.50	$58.35	$105.00	$108.70	$112.50	$115.00	$100.00	$100.00	$105.00	$100.00
Feb.	39.25	69.75	207.50	231.25	250.00	215.00	172.50	100.00	60.42	107.50	107.50	115.00	115.00	100.00	100.00	105.00	95.50
March	38.50	100.00	349.60	290.00	250.00	175.00	216.25	96.00	62.50	113.75	107.50	115.00	97.60	100.00	100.00	105.00	94.00
April	38.00	100.00	406.25	362.50	290.00	150.00	240.00	90.00	64.37	120.00	107.50	115.00	88.00	100.00	100.00	105.00	94.00
May	38.00	100.00	387.50	426.50	290.00	138.40	250.00	85.00	66.87	128.00	107.50	115.00	88.00	94.00	103.00	105.00	94.00
June	38.00	100.00	270.00	443.75	290.00	121.00	225.00	80.00	67.50	128.75	107.50	115.00	88.00	90.00	105.00	105.00	94.00
July	37.20	109.00	175.00	406.25	290.00	111.00	225.00	70.60	67.50	*119.50	106.50	115.00	88.00	90.00	105.00	105.00	94.00
Aug.	108.33	127.25	172.00	400.00	290.00	101.25	198.75	70.00	67.50	117.50	95.75	115.00	88.00	90.00	105.00	105.00	94.00
Sept.	90.00	117.00	169.75	387.50	285.00	98.75	170.00	65.80	75.63	*111.25	90.00	115.00	88.00	90.00	105.00	105.00	94.00
Oct.	70.40	105.00	162.25	310.00	285.00	105.00	170.00	63.00	100.00	*110.00	90.00	115.00	88.00	90.00	105.00	105.00	94.00
Nov.	68.00	105.00	160.80	256.00	285.00	112.50	170.00	61.50	100.00	*108.75	98.75	115.00	96.60	90.00	105.00	105.00	94.00
Dec.	72.20	106.00	169.75	243.75	275.00	122.50	135.00	60.00	100.00	*108.25	107.00	115.00	100.00	100.00	105.00	105.00	82.80
Aver.	*56.86*	*105.83*	*231.70*	*327.21*	*277.50*	*142.12*	*193.21*	*79.53*	*74.22*	*114.85*	*102.85*	*114.79*	*95.02*	*94.50*	*103.17*	*105.00*	*93.70*

*Price at furnace, where lower than price at seaboard.

Spiegeleisen (19 to 21 Per Cent), Dollars per Gross Ton at Furnace

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$25.00	$25.00	$30.38	$60.00	$60.00	$66.00	$51.40	$45.00	$26.00	$34.40	$38.00	$33.00	$32.00	$37.00	$30.80	$31.00	$31.00
Feb.	25.00	25.00	36.25	68.75	61.25	60.75	58.75	40.00	38.00	35.50	38.00	33.00	32.00	37.00	31.00	31.00	31.00
March	25.00	25.00	37.00	75.00	71.25	47.00	60.00	35.00	29.40	40.00	38.00	33.00	32.00	37.00	31.00	31.00	31.00
April	25.00	25.00	65.00	75.00	80.75	45.00	67.60	34.00	32.25	45.00	36.80	33.00	32.00	37.00	31.00	31.00	31.00
May	25.00	25.00	65.00	81.00	84.00	37.40	75.00	32.00	35.00	52.50	36.00	33.00	32.00	36.25	31.00	31.00	31.00
June	25.00	25.00	61.00	82.50	89.00	31.25	75.00	32.00	36.00	48.50	35.00	32.80	32.00	35.50	31.00	31.00	31.00
July	25.00	25.00	52.50	85.00	89.00	35.00	75.00	27.00	36.00	44.00	34.20	32.00	32.00	33.50	31.00	31.00	31.00
Aug.	25.00	25.00	45.00	85.00	89.00	35.00	80.00	26.00	37.80	46.75	32.50	32.00	32.00	33.00	32.50	31.00	31.00
Sept.	25.00	26.60	45.00	82.50	83.75	35.00	82.00	26.00	38.25	43.75	31.40	31.80	32.00	33.00	33.00	31.00	31.00
Oct.	25.00	29.25	42.75	76.25	82.00	35.00	81.88	26.00	38.00	43.75	30.75	31.25	32.00	30.75	33.00	31.00	31.00
Nov.	25.00	29.25	45.40	66.00	80.25	37.00	75.62	26.00	37.50	41.25	30.25	32.00	37.40	30.00	30.00	31.00	30.50
Dec.	25.00	29.25	55.00	60.00	74.38	40.00	59.10	26.00	37.50	39.00	32.00	32.00	36.50	30.00	31.00	31.00	28.40
Aver.	*25.00*	*26.20*	*50.02*	*74.75*	*78.72*	*42.03*	*70.11*	*31.25*	*34.31*	*42.87*	*34.41*	*32.40*	*32.83*	*34.17*	*31.36*	*31.00*	*30.74*

50 Per Cent Ferrosilicon (Gross Ton, Delivered East of Mississippi)

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$80.00	$75.00	$54.00	$82.50	$75.00	$82.50	$85.00	$85.00	$83.50	$83.50	$83.50
Feb.	85.00	93.00	55.00	83.75	75.00	82.50	85.00	85.00	83.50	83.50	83.50
March	85.00	92.40	55.00	90.00	75.00	82.50	85.00	85.00	83.50	83.50	83.50
April	85.00	86.25	55.00	92.50	75.00	82.50	85.00	85.00	83.50	83.50	83.50
May	80.00	76.40	55.00	94.50	75.00	82.50	85.00	85.00	83.50	83.50	83.50
June	80.00	69.75	55.00	90.00	75.00	82.50	85.00	85.00	83.50	83.50	83.50
July	80.00	66.00	55.00	82.50	71.00	82.50	85.00	85.00	83.50	83.50	83.50
Aug.	75.00	60.80	55.00	82.50	71.25	82.50	85.00	85.00	83.50	83.50	83.50
Sept.	75.00	60.00	55.00	82.50	72.00	82.50	85.00	85.00	83.50	83.50	83.50
Oct.	75.00	58.50	67.00	81.00	71.00	82.50	85.00	85.00	83.50	83.50	83.50
Nov.	75.00	55.80	75.00	80.63	70.00	82.50	85.00	85.00	83.50	83.50	83.50
Dec.	75.00	56.00	82.50	76.25	75.00	82.50	85.00	83.50	83.50	83.50	83.50
Aver.	*79.17*	*70.83*	*59.88*	*84.89*	*73.35*	*82.50*	*85.00*	*84.88*	*83.50*	*83.50*	*83.50*

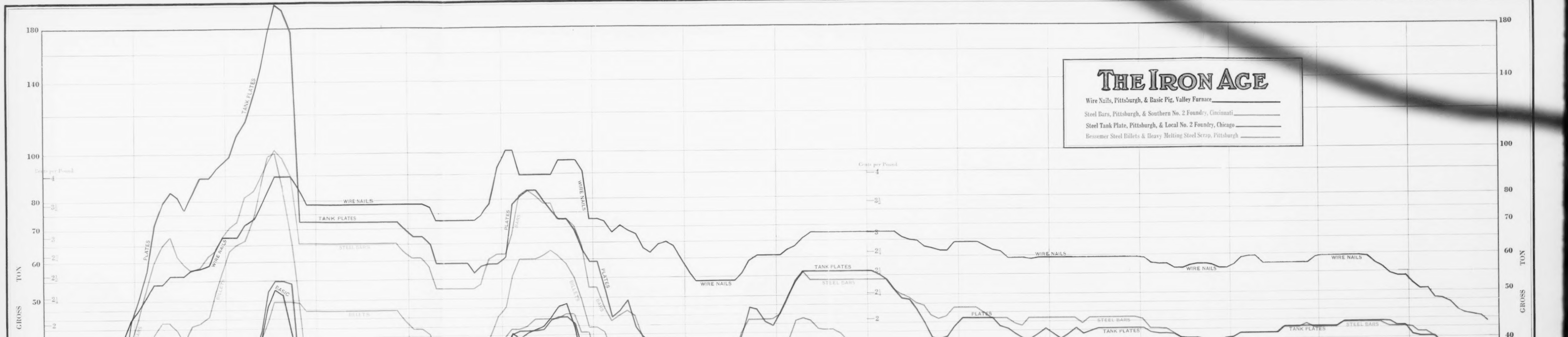
Connellsville Coke Prices for Nineteen Years

Prompt Connellsville Furnace Coke, per Net Ton at Oven

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$1.82	$3.88	$1.85	$1.50	$2.94	$9.50	$6.00	$5.65	$6.00	$5.06	$2.75	$8.05	$3.94	$3.94	$7.19	$3.50	$2.70	$2.75	$2.55
Feb.	1.78	2.52	1.85	1.50	3.38	9.62	6.00	4.44	6.00	4.50	3.04	7.13	4.08	3.63	7.31	3.38	2.68	2.90	2.60
March	2.12	2.40	1.90	1.50	3.47	9.60	6.00	4.06	6.00	4.35	3.25	7.25	4.08	3.35	3.05	3.35	2.60	2.98	2.60
April	2.39	2.15	1.86	1.50	2.41	7.38	6.00	3.65	9.60	3.50	4.48	6.31	3.75	3.04	3.00	3.20	2.60	2.78	2.60
May	2.28	2.13	1.77	1.50	2.30	7.80	6.00	3.69	12.00	3.25	6.00	5.15	3.25	3.00	2.91	2.94	2.60	2.75	2.53
June	2.02	2.11	1.75	1.56	2.49	11.25	6.00	4.00	15.00	3.00	6.75	4.75	3.19	2.77	2.83	2.93	2.60	2.75	2.50
July	2.21	2.45	1.75	1.64	2.75	12.75	6.00	4.07	17.20	2.81	10.75	4.55	3.00	2.83	2.84	3.00	2.63	2.75	2.50
Aug.	2.21	2.50	1.70	1.50	2.80	13.60	6.00	4.31	17.75	2.75	12.80	4.56	3.00	3.06	2.95	3.00	2.75	2.73	2.58
Sept.	2.37	2.29	1.65	1.61	2.94	11.12	6.00	4.56	16.70	3.15	11.13	4.50	3.00	3.49	3.38	2.85	2.75	2.65	2.60
Oct.	3.41	2.98	1.60	2.03	4.88	6.00	6.00	4.52	15.12	3.28	9.60	3.85	3.00	6.13	3.63	2.85	2.83	2.65	2.60
Nov.	3.94	1.82	1.52	2.28	6.90	6.00	6.00	5.87	8.26	3.03	7.19	3.81	3.04	5.75	4.43	2.77	2.75	2.65	2.53
Dec.	4.00	1.75	1.50	2.64	8.38	6.00	6.00	6.12	6.20	2.75	7.00	4.00	3.68	4.32	3.50	2.75	2.75	2.63	2.50
Average	*2.55*	*2.42*	*1.73*	*1.73*	*3.80*	*9.22*	*6.00*	*4.58*	*11.32*	*3.45*	*7.01*	*5.33*	*3.42*	*3.78*	*3.92*	*3.04*	*2.69*	*2.75*	*2.56*

Prompt Connellsville Foundry Coke, per Net Ton at Oven

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$1.97	$4.40	$2.50	$2.00	$3.50	$9.75	$7.00	$6.25	$7.00	$6.38	$3.75	$8.70	$4.75	$4.88	$7.75	$4.50	$3.75	$3.75	$3.50
Feb.	2.09	3.25	2.50	2.00	3.50	11.00	7.00	5.00	7.00	5.63	4.00	8.25	4.88	4.31	8.31	4.31	3.75	3.75	3.50
March	2.56	3.00	2.45	2.00	3.75	11.60	7.00	4.94	7.00	5.45	4.25	8.38	4.88	4.15	4.40	4.40	3.75	3.75	3.50
April	2.69	3.00	2.40	2.00	3.56	9.13	7.00	4.30	10.20	4.75	5.06	7.56	4.75	4.00	4.06	4.06	3.75	3.75	3.50
May	2.58	2.85	2.40	2.00	3.25	8.90	7.00	4.31	13.00	4.50	6.30	6.15	4.69	4.00	4.00	4.00	3.75	3.75	3.50
June	2.40	2.80	2.32	2.00	3.25	11.72	7.00	4.56	15.75	4.45	7.25	5.56	4.38	3.80	4.00	4.00	3.75	3.75	3.50
July	2.40	2.70	2.22	2.05	3.25	13.25	7.00	5.00	17.80	4.06	11.00	5.35	4.10	3.75	4.00	4.00	3.75	3.75	3.50
Aug.	2.40	2.90	2.25	2.00	3.30	13.20	7.00	5.25	18.88	3.75	13.90	5.38	4.00	3.88	4.00	4.00	3.75	3.75	3.50
Sept.	2.54	2.90	2.10	2.07	3.31	11.75	7.00	5.80	17.70	4.15	12.50	5.50	4.00	4.25	4.38	4.00	3.75	3.75	3.50
Oct.	3.65	2.81	2.00	2.35	3.88	6.00	7.00	6.25	16.38	4.38	11.70	4.80	4.00	6.31	4.63	4.00	3.75	3.75	3.50
Nov.	4.25	2.60	1.92	2.88	7.10	7.00	7.00	7.00	9.50	4.19	8.38	4.81	4.06	6.81	5.50	3.85	3.75	3.75	3.50
Dec.	4.50	2.50	1.90	2.95	8.63	7.00	7.00	7.00	7.00	3.81	7.88	4.81	4.55	5.20	4.50	3.75	3.75	3.75	3.50
Average	*2.84*	*2.98*	*2.25*	*2.19*	*4.19*	*10.03*	*7.00*	*5.47*	*12.27*	*4.63*	*8.00*	*6.27*	*4.42*	*4.61*	*4.96*	*4.11*	*3.75*	*3.75*	*3.50*


THE IRON AGE
Wire Nails, Pittsburgh, & Basic Pig, Valley Furnace
Steel Bars, Pittsburgh, & Southern No. 2 Foundry, Cincinnati
Steel Tank Plate, Pittsburgh, & Local No. 2 Foundry, Chicago
Bessemer Steel Billets & Heavy Melting Steel Scrap, Pittsburgh
GROSS TON
Cents per Pound
180
140
100
80
70
60
50
40
4
3½
3
2½
2
WIRE NAILS
TANK PLATES
STEEL BARS
BILLETS
BASIC
PLATES

Sixteen Years of Prices of Pig Iron, Finished and Semi-Finished Steel and Heavy Melting Scrap

HERMAN JASON
HERMAN JASON
HERMAN JASON
HERMAN JASON

Heavy Melting Steel Scrap Composite Price

(Average of Pittsburgh, Chicago and Philadelphia Quotations, per Gross Ton)

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$10.29	$10.27	$16.46	$21.73	$29.93	$17.77	$25.13	$15.04	$12.45	$20.22	$19.15	$20.08	$16.97	$15.17	$13.70	$17.02	$14.65
Feb.	11.39	10.39	16.10	21.35	29.92	14.75	26.00	15.21	12.46	21.46	19.21	18.27	15.50	14.58	13.71	16.96	14.92
March	11.10	10.78	17.28	23.60	29.58	14.52	25.50	13.17	13.46	24.79	17.56	16.92	15.83	14.65	13.65	16.71	14.88
April	10.83	10.61	17.42	26.63	28.47	15.79	24.42	11.63	14.71	24.00	15.20	15.48	15.27	14.71	13.81	17.18	14.30
May	10.60	10.79	16.47	27.63	28.79	15.06	23.71	12.20	15.67	20.77	14.71	15.46	14.35	13.95	13.90	16.54	13.71
June	10.57	10.78	15.25	37.21	28.87	16.54	23.47	11.47	15.52	18.94	14.88	16.09	14.40	13.60	13.52	16.39	13.31
July	10.50	11.65	15.19	36.00	29.00	19.13	24.21	11.00	15.92	17.23	16.00	16.46	15.42	13.48	13.13	16.60	13.08
Aug.	10.42	13.00	15.35	31.30	29.00	20.25	25.88	11.57	16.30	16.58	16.58	17.23	15.88	13.80	13.75	16.86	13.29
Sept.	10.30	13.79	15.67	31.50	29.00	18.87	26.53	12.15	18.33	16.98	17.20	17.39	16.25	13.92	14.75	16.60	13.70
Oct.	9.71	13.62	16.90	26.60	29.00	18.67	23.73	12.88	19.20	15.15	17.08	17.08	15.58	13.48	15.85	15.58	12.77
Nov.	9.13	14.63	20.40	27.83	28.50	20.50	20.00	12.73	18.02	15.13	18.17	17.63	15.25	13.18	15.73	14.83	11.69
Dec.	9.50	16.20	24.13	28.87	25.00	22.77	15.92	12.29	17.94	17.37	20.08	17.39	15.08	13.48	15.97	14.13	11.28
Aver.	*10.36*	*12.21*	*17.22*	*28.35*	*28.76*	*17.89*	*23.71*	*12.61*	*15.83*	*19.05*	*17.15*	*17.12*	*15.48*	*14.00*	*14.29*	*16.28*	*13.15*

Scrap Prices at Pittsburgh, per Gross Ton

No. 1 Heavy Melting Steel

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$10.90	$11.63	$17.50	$22.60	$30.00	$19.00	$26.30	$15.50	$14.30	$21.80	$21.38	$21.50	$18.63	$16.88	$15.10	$19.31	$16.69
Feb.	12.62	11.63	17.06	21.75	30.00	14.75	27.75	16.00	14.00	23.25	20.88	19.50	17.50	16.13	14.94	18.63	16.81
March	12.12	12.00	18.45	23.25	30.00	14.00	27.25	14.00	15.13	25.38	19.38	18.50	17.55	16.55	14.81	18.44	16.56
April	12.00	11.81	17.81	28.00	28.50	15.20	26.00	12.63	16.38	25.88	16.20	17.00	16.63	16.50	15.31	18.60	15.95
May	12.00	11.75	16.95	28.80	28.50	14.75	25.00	13.30	17.30	22.80	15.63	16.75	15.69	15.40	15.25	17.88	15.25
June	12.00	11.75	15.88	41.00	28.62	17.12	25.00	12.69	17.00	21.13	16.00	17.30	15.75	14.81	14.56	18.25	15.13
July	12.00	12.31	16.31	39.00	29.00	19.70	26.00	12.00	17.38	18.10	17.50	18.00	16.81	15.00	14.10	18.55	14.75
Aug.	11.50	13.81	16.05	32.83	29.00	21.00	28.13	12.70	17.75	17.75	17.50	18.88	17.50	15.40	15.50	19.00	15.13
Sept.	11.31	14.30	16.19	33.25	29.00	19.20	29.00	13.63	20.13	17.88	18.10	18.70	17.88	15.50	16.56	18.31	15.60
Oct.	10.85	14.38	18.25	28.80	29.00	19.00	27.75	14.13	21.40	15.70	18.50	18.50	17.25	14.75	17.60	17.30	14.56
Nov.	10.00	15.88	21.20	29.50	28.87	22.25	23.50	14.30	20.50	16.13	19.63	19.50	17.20	14.25	17.19	16.39	13.19
Dec.	10.75	17.45	26.00	30.00	26.87	24.25	17.20	14.25	20.13	18.75	21.40	19.10	16.75	14.88	17.90	15.45	12.75
Aver.	*11.50*	*13.23*	*18.14*	*29.90*	*28.95*	*18.35*	*25.74*	*13.76*	*17.62*	*20.38*	*18.51*	*18.60*	*17.10*	*15.50*	*15.74*	*18.01*	*15.20*

Machine Shop Turnings

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$16.90	$15.75	$17.50	$14.30	$12.00	$10.80	$11.50	$11.50
Feb.	18.50	16.13	15.88	13.63	11.38	10.88	11.50	11.39
March	20.38	14.50	14.20	13.35	12.00	10.25	10.63	10.94
April	20.50	12.45	13.39	12.00	12.63	10.44	11.15	10.90
May	19.20	11.88	12.25	11.00	11.30	10.20	11.06	10.19
June	17.19	13.00	13.05	11.00	10.50	9.00	11.63	9.56
July	12.10	13.50	13.63	11.38	11.50	9.10	11.90	8.60
Aug.	11.44	14.13	15.00	12.80	11.80	9.88	13.00	8.00
Sept.	12.88	14.40	14.75	13.06	11.63	11.13	12.06	8.00
Oct.	11.60	14.25	14.39	12.06	11.50	11.10	11.75	6.88
Nov.	11.63	15.94	15.00	11.90	11.10	11.00	11.00	6.00
Dec.	13.75	17.20	14.30	11.56	11.00	11.10	10.25	6.00
Aver.	*15.51*	*14.43*	*14.44*	*12.84*	*11.53*	*10.41*	*11.45*	*8.98*

Compressed Sheets

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$20.50	$18.88	$20.00	$17.63	$15.50	$14.15	$18.81	$16.39
Feb.	21.75	19.63	18.00	16.13	15.06	14.06	18.31	16.19
March	23.75	17.50	17.35	15.60	15.45	14.56	18.25	15.75
April	24.75	14.60	15.63	15.25	15.56	14.94	18.55	15.60
May	24.30	13.75	15.46	14.75	14.49	14.90	17.81	15.06
June	19.88	14.38	16.30	14.60	13.75	14.25	18.13	14.81
July	16.90	15.70	16.63	15.50	14.31	13.60	18.25	14.65
Aug.	16.13	16.00	17.39	16.40	14.45	14.75	18.44	14.94
Sept.	16.00	16.55	17.40	16.50	14.50	16.39	18.19	14.95
Oct.	14.30	16.50	17.39	15.63	14.50	17.15	17.15	14.19
Nov.	14.25	17.75	18.00	16.00	13.70	17.00	16.13	12.81
Dec.	16.50	19.40	18.00	15.56	13.94	17.80	15.15	12.00
Aver.	*19.08*	*16.72*	*17.27*	*15.80*	*14.59*	*15.30*	*17.77*	*14.78*

No. 1 Cast Cupola Scrap

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$23.30	$21.00	$19.63	$17.50	$16.00	$14.50	$16.00	$14.00
Feb.	24.75	21.38	20.13	17.00	15.56	14.50	15.00	14.00
March	26.75	20.25	18.60	17.00	15.80	14.50	15.13	14.00
April	27.75	18.50	17.75	16.50	16.00	14.50	15.39	14.00
May	26.30	17.88	17.50	16.50	15.70	14.50	15.50	14.00
June	24.13	17.25	17.10	15.90	15.13	14.25	15.50	14.00
July	21.10	17.80	17.00	15.75	15.00	14.25	15.50	13.00
Aug.	21.38	18.00	17.50	16.80	15.00	14.50	15.50	13.00
Sept.	21.75	18.00	17.40	16.50	15.00	14.94	15.50	13.00
Oct.	19.50	18.00	17.39	16.00	14.75	15.40	15.50	12.88
Nov.	18.63	18.13	18.00	16.30	14.35	15.00	15.13	12.13
Dec.	20.00	19.10	17.70	16.00	14.38	14.80	14.50	12.10
Aver.	*22.95*	*18.77*	*17.98*	*16.48*	*15.22*	*14.64*	*15.34*	*13.34*

Cast Iron Borings

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$18.40	$16.94	$17.50	$14.88	$12.50	$11.30	$12.88	$11.25
Feb.	19.50	16.88	15.88	14.13	12.13	11.00	12.50	11.56
March	21.13	15.38	14.10	13.30	12.50	10.50	12.25	11.00
April	21.88	13.00	13.39	12.50	12.38	11.00	12.45	10.55
May	20.20	12.75	12.50	11.75	11.10	10.90	12.00	10.39
June	17.88	14.00	13.05	11.90	10.50	10.39	12.25	9.88
July	15.20	13.80	13.63	12.38	10.63	10.00	12.40	8.90
Aug.	13.88	14.75	15.00	12.75	11.00	10.75	12.75	8.50
Sept.	15.63	14.90	14.75	12.94	11.00	12.13	12.25	8.65
Oct.	13.50	15.00	14.39	12.50	11.00	12.50	12.25	8.00
Nov.	12.75	15.13	15.00	12.90	11.00	12.13	11.63	7.75
Dec.	14.88	16.70	14.90	12.13	11.13	12.00	10.75	7.40
Aver.	*17.07*	*14.94*	*14.51*	*12.84*	*11.57*	*11.22*	*12.20*	*9.49*

Low-Phosphorus Scrap, at Pittsburgh; Billet and Bloom Crops; Per Gross Ton

	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$17.60	$25.30	$23.60	$26.50	$24.00	$21.00	$18.50	$22.00	$20.88
Feb.	17.13	27.50	25.13	24.75	22.25	20.25	18.50	22.00	21.25
March	17.38	32.00	24.00	23.30	22.00	20.30	18.50	22.50	21.50
April	18.88	32.25	19.40	22.13	21.13	21.00	18.50	23.45	21.40
May	20.00	28.60	19.50	21.63	20.00	20.00	18.60	22.50	19.88
June	20.00	25.88	20.13	22.00	20.00	19.25	19.00	22.25	19.13
July	20.13	22.00	20.90	22.00	20.75	19.00	19.00	22.45	19.20
Aug.	21.20	23.50	21.88	22.25	21.00	19.00	19.13	23.00	19.38
Sept.	24.25	24.38	22.60	23.00	21.67	20.00	19.88	22.39	20.00
Oct.	25.00	21.90	23.00	23.13	20.50	19.25	20.20	21.75	18.75
Nov.	24.00	20.50	23.25	24.00	20.60	18.30	20.50	21.13	17.13
Dec.	24.00	21.75	25.13	24.00	21.13	18.50	21.00	20.75	17.00
Aver.	*20.80*	*25.46*	*22.39*	*23.22*	*21.25*	*19.65*	*19.28*	*22.18*	*19.63*

No. 1 Railroad Cast Scrap at Cincinnati

(Net Ton)

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$17.20	$17.25	$17.38	$15.75	$14.00	$12.00	$13.73	$13.39
Feb.	19.50	17.75	15.88	15.00	13.00	12.00	13.67	13.39
March	21.75	16.25	15.50	14.50	13.00	11.60	13.62	13.39
April	22.00	14.00	15.13	14.10	13.00	11.60	13.62	13.39
May	20.60	13.00	15.00	13.50	13.00	11.43	13.62	13.28
June	18.00	13.38	15.90	13.63	13.00	11.39	13.62	12.95
July	16.70	14.50	16.00	14.50	13.00	11.39	13.62	12.95
Aug.	16.25	14.50	15.63	14.75	13.00	11.39	13.62	12.95
Sept.	16.88	15.30	15.50	15.00	13.00	11.60	13.62	11.52
Oct.	14.50	14.88	15.00	14.39	12.50	12.60	13.57	11.15
Nov.	13.66	15.63	15.88	14.00	12.25	13.17	13.39	11.15
Dec.	15.00	16.38	16.00	14.00	12.00	13.35	13.39	10.80
Aver.	*17.67*	*15.23*	*15.73*	*14.42*	*12.90*	*11.96*	*13.59*	*12.53*

No. 1 Machinery Cast Scrap at Cincinnati

(Net Ton)

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$20.39	$20.50	$20.12	$19.75	$17.00	$14.30	$17.14	$16.52
Feb.	21.75	21.50	19.12	19.39	16.00	14.30	17.24	16.52
March	23.65	20.00	18.35	19.00	16.00	13.85	17.19	16.52
April	24.75	18.00	17.75	17.80	16.00	13.85	17.19	16.52
May	24.05	16.75	17.75	17.00	15.60	13.65	17.19	15.85
June	22.13	17.13	18.15	17.00	15.50	13.60	17.19	15.63
July	20.25	18.25	18.25	17.00	15.50	13.55	17.19	15.63
Aug.	19.05	18.25	19.00	17.63	15.50	13.40	17.05	15.63
Sept.	19.38	18.13	19.25	18.00	15.50	14.20	16.96	13.48
Oct.	18.00	17.68	19.00	17.39	15.50	15.65	16.92	12.95
Nov.	16.85	18.40	20.12	17.00	14.50	16.70	16.57	12.95
Dec.	18.00	18.75	20.00	17.00	14.00	16.60	16.52	12.59
Aver.	*20.69*	*18.69*	*18.91*	*17.83*	*15.55*	*14.47*	*17.03*	*15.07*

Scrap Prices at Chicago, per Gross Ton

No. 1 Heavy Melting Steel

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$9.35	$9.19	$15.50	$21.12	$30.00	$17.40	$24.50	$15.13	$11.45	$19.15	$17.69	$19.44	$15.12	$13.25	$12.50	$15.39	$12.75
Feb.	10.50	9.56	14.75	21.50	30.25	15.06	25.00	15.13	11.38	20.33	17.88	17.69	13.88	13.00	12.69	15.88	13.31
March	9.81	9.63	16.50	23.70	29.87	15.63	24.25	12.50	12.38	23.50	16.56	16.45	13.95	12.90	12.63	15.66	13.19
April	9.80	9.15	16.50	27.00	28.75	16.41	23.75	11.00	13.75	22.50	14.10	14.81	13.19	13.13	12.63	15.95	13.00
May	9.69	9.37	15.94	28.70	28.80	15.62	23.00	11.50	14.95	19.70	13.75	15.00	12.13	12.35	12.95	15.39	12.50
June	9.75	9.44	14.80	36.50	29.00	16.69	22.95	10.81	14.56	17.88	13.63	15.75	12.45	12.00	12.63	14.94	12.06
July	9.75	10.40	14.50	33.00	29.00	19.40	24.13	10.00	15.25	17.05	14.90	15.60	14.19	12.06	12.30	14.75	12.00
Aug.	9.69	11.56	15.25	29.60	29.00	20.88	25.35	10.60	15.95	16.00	15.50	16.44	14.00	12.30	12.75	15.06	12.13
Sept.	9.19	11.75	16.06	31.25	29.00	19.10	24.81	11.31	18.13	16.31	16.40	16.35	14.00	12.25	12.94	15.13	12.50
Oct.	8.50	11.75	16.81	26.00	29.00	18.25	21.50	12.44	18.40	14.15	16.13	16.00	13.00	11.69	13.95	14.30	11.38
Nov.	8.06	13.44	20.60	27.60	28.50	20.88	18.45	12.25	17.31	14.00	17.13	16.00	13.00	11.50	14.50	13.15	10.13
Dec.	8.43	15.63	23.00	28.37	22.75	21.80	16.20	11.13	17.25	16.06	18.95	15.75	13.00	12.06	14.55	12.50	10.00
Aver.	*9.38*	*10.91*	*16.68*	*27.86*	*28.66*	*18.09*	*22.82*	*11.98*	*15.06*	*18.05*	*16.05*	*16.27*	*13.49*	*12.39*	*13.09*	*14.84*	*12.08*

Old Steel Rerolling Rails

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$11.10	$9.62	$17.06	$27.00	$35.00	$22.10	$34.25	$15.63	$12.10	$20.40	$18.88	$21.75	$17.50	$16.38	$14.90	$17.00	$14.63
Feb.	11.81	9.87	17.06	27.00	35.00	16.44	34.38	15.50	12.00	21.75	20.13	19.25	16.63	15.94	15.00	17.50	15.00
March	11.56	10.25	17.65	28.00	34.75	16.38	32.30	13.30	13.31	24.63	19.13	17.86	16.50	15.60	14.44	17.50	15.00
April	11.50	10.25	18.00	32.62	33.50	17.55	32.13	12.63	14.50	23.75	16.30	16.00	16.13	16.00	13.81	17.50	15.00
May	11.31	10.25	17.38	36.50	34.00	17.75	31.75	13.40	15.70	21.70	15.00	16.88	15.19	15.20	14.40	17.50	14.81
June	11.50	10.25	15.85	46.90	34.00	18.75	32.65	12.94	15.25	19.25	14.81	17.85	15.45	14.75	14.81	17.50	14.63
July	11.50	10.30	15.25	45.19	34.00	25.15	35.00	12.25	16.13	18.00	15.50	17.44	17.19	14.88	14.75	17.50	14.50
Aug.	11.50	12.25	15.80	39.20	34.00	29.50	38.00	12.45	16.90	17.50	16.19	19.00	17.10	15.30	15.13	17.75	14.50
Sept.	10.75	13.35	17.06	39.75	34.00	26.80	38.13	13.13	19.38	17.38	17.30	19.25	17.39	15.19	15.88	17.81	14.40
Oct.	10.00	13.31	18.81	34.75	34.00	27.19	33.44	14.00	20.30	15.80	17.06	18.88	16.63	14.88	16.50	17.20	13.88
Nov.	9.50	14.44	24.50	34.80	33.50	31.25	22.90	13.80	18.38	15.06	18.19	19.44	16.50	14.50	16.63	15.50	12.50
Dec.	9.50	16.63	28.63	35.25	27.50	31.90	16.90	12.63	17.75	17.00	20.36	19.10	16.19	14.63	16.60	14.60	12.50
Aver.	*10.96*	*11.73*	*18.59*	*35.58*	*33.60*	*23.40*	*31.90*	*13.47*	*15.98*	*19.35*	*17.40*	*18.56*	*16.53*	*15.27*	*15.24*	*17.07*	*14.28*

Cast Iron Borings

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$10.08	$18.48	$12.54	$16.11	$10.92	$6.38	$15.57	$13.58	$15.56	$13.39	$10.06	$10.40	$12.50	$9.56
Feb.	10.15	18.48	8.75	16.39	11.76	6.93	16.59	15.55	14.63	12.06	10.13	10.13	12.00	10.13
March	10.64	18.48	10.15	15.74	8.40	8.05	18.91	14.38	13.85	11.75	10.20	9.63	10.63	9.56
April	11.83	17.99	10.47	15.96	7.28	9.24	17.92	11.40	10.94	10.94	10.44	9.31	10.40	9.25
May	13.44	17.53	9.31	14.43	6.61	10.98	16.24	10.00	10.00	9.75	10.00	9.25	10.19	8.81
June	19.60	17.77	9.33	13.38	5.60	11.63	14.43	10.06	10.70	9.95	9.56	9.00	9.88	8.00
July	20.01	18.48	12.71	14.15	5.32	12.67	13.66	10.45	11.13	11.19	9.94	9.05	9.75	7.90
Aug.	18.36	18.48	14.28	15.06	5.38	12.88	12.04	10.69	12.75	11.45	10.50	9.31	10.19	7.75
Sept.	18.20	18.48	13.55	14.65	5.60	14.43	12.19	11.80	13.15	11.19	10.75	9.75	10.50	7.35
Oct.	15.75	18.48	11.63	12.88	6.44	14.90	10.42	11.56	12.75	8.88	10.13	10.75	10.00	5.75
Nov.	17.25	16.80	12.88	11.93	6.83	14.56	10.08	12.63	13.19	9.20	9.60	11.69	9.25	4.13
Dec.	18.05	14.84	14.17	10.98	6.09	14.56	12.04	14.36	13.50	9.50	10.19	11.85	9.15	4.90
Aver.	*15.28*	*17.94*	*11.65*	*14.30*	*7.19*	*11.43*	*14.17*	*12.21*	*12.68*	*10.77*	*10.13*	*10.01*	*10.37*	*7.76*

Steel Knuckles and Couplers

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$25.20	$37.52	$24.51	$27.44	$16.39	$12.77	$24.98	$21.21	$22.88	$18.00	$16.25	$14.65	$16.50	$16.00
Feb.	25.20	36.89	19.32	29.68	16.11	12.39	26.53	21.77	21.00	17.13	16.00	14.50	17.00	16.00
March	26.60	35.00	19.60	27.66	13.55	14.12	28.71	20.00	18.70	16.70	15.60	14.06	17.00	15.88
April	30.67	34.00	19.21	26.32	12.47	15.68	27.93	17.40	17.63	16.44	15.69	13.81	17.30	15.25
May	33.71	34.00	17.36	25.48	13.66	16.69	25.42	17.00	17.63	15.39	14.80	14.50	17.13	14.31
June	43.83	34.00	18.20	25.20	13.16	15.89	22.55	16.63	19.00	15.30	14.25	14.25	16.75	13.75
July	45.92	34.00	20.50	27.16	11.63	17.92	21.00	17.20	18.19	17.39	14.25	13.75	16.75	13.50
Aug.	44.24	34.00	23.52	29.01	12.21	19.21	20.87	18.00	19.50	17.50	14.40	14.00	16.94	13.50
Sept.	40.88	34.00	21.95	27.72	13.03	21.84	21.56	19.35	19.50	17.39	14.00	14.75	17.00	13.50
Oct.	33.38	34.00	21.43	24.51	14.84	22.96	18.92	18.25	18.63	16.06	13.25	15.75	17.00	13.00
Nov.	33.04	34.00	23.39	20.83	14.28	21.84	17.64	19.62	18.75	15.50	13.00	16.00	16.39	12.13
Dec.	35.67	32.55	24.86	16.95	12.60	22.12	19.88	22.78	18.25	15.50	13.69	16.00	16.00	12.00
Aver.	*34.86*	*34.50*	*21.15*	*25.67*	*13.66*	*17.79*	*23.00*	*19.10*	*19.14*	*16.53*	*14.60*	*14.67*	*16.81*	*14.07*

Railroad Malleable Scrap

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$10.36	$9.11	$15.47	$19.88	$30.02	$19.71	$32.48	$16.52	$12.77	$25.26	$20.93	$21.13	$18.00	$16.06	$13.60	$18.69	$16.39
Feb.	11.63	8.96	14.93	19.39	30.02	16.65	33.53	17.36	12.81	26.75	21.77	20.00	17.56	16.06	13.50	19.39	17.13
March	10.71	8.89	15.62	20.10	31.24	18.07	31.92	15.46	13.87	28.56	21.00	19.10	17.60	16.00	12.63	19.39	16.88
April	10.25	8.96	15.56	22.81	31.64	17.70	30.95	13.59	15.68	28.00	19.30	17.50	17.39	15.88	12.75	19.35	16.55
May	10.24	9.12	15.05	26.10	32.82	17.08	29.68	14.11	16.80	25.54	18.13	17.63	16.50	14.45	13.00	18.56	15.75
June	10.08	9.11	13.14	35.41	33.04	17.92	28.73	12.88	16.73	24.08	16.88	18.00	16.60	13.50	12.69	17.81	13.94
July	10.08	9.97	13.03	33.73	33.28	20.94	30.24	12.53	17.51	22.51	17.00	17.88	17.81	13.63	12.50	16.85	13.50
Aug.	9.95	11.20	12.60	33.26	34.01	22.96	32.20	13.44	19.04	20.59	17.38	19.13	17.75	14.50	12.88	16.94	13.50
Sept.	9.24	11.48	12.88	34.44	34.01	21.22	30.95	14.63	23.67	21.71	18.20	19.10	17.39	13.69	14.39	17.00	13.50
Oct.	8.85	11.48	13.87	28.28	34.01	21.35	26.32	15.12	24.42	19.66	18.13	18.50	16.50	13.13	15.30	17.00	13.13
Nov.	8.68	12.75	17.92	28.67	32.68	25.89	21.78	14.67	23.11	18.91	19.00	19.19	16.50	12.55	15.88	16.39	12.69
Dec.	8.90	15.40	20.16	30.63	25.48	28.78	16.80	12.81	22.40	20.23	20.28	18.30	16.00	12.81	17.00	16.10	12.25
Aver.	*9.91*	*10.53*	*15.02*	*27.72*	*31.85*	*20.85*	*28.80*	*14.43*	*18.23*	*23.48*	*19.00*	*18.79*	*17.13*	*14.36*	*13.85*	*17.79*	*14.60*

Old Cast Iron Carwheels

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$11.65	$9.94	$14.63	$18.87	$30.00	$25.90	$36.13	$21.00	$15.30	$26.70	$20.50	$21.38	$18.00	$15.31	$13.90	$14.13	$13.81
Feb.	12.44	10.00	13.94	18.25	30.00	22.75	38.06	20.63	15.00	27.25	21.00	19.38	17.13	15.13	14.00	14.50	14.69
March	11.88	9.94	14.30	20.25	30.00	21.50	36.20	15.90	16.50	28.38	21.00	17.10	17.00	15.00	13.88	14.50	14.69
April	11.55	9.75	13.88	23.62	29.00	21.50	37.50	14.06	18.63	27.75	16.70	16.00	16.39	15.00	13.50	14.50	14.45
May	11.50	9.75	12.95	27.35	29.00	21.25	37.50	14.70	18.50	24.10	16.25	16.06	15.25	14.05	13.45	14.50	13.88
June	11.50	10.19	12.44	39.00	29.00	22.00	35.90	13.31	18.25	21.88	15.63	17.30	15.30	13.50	13.06	14.39	13.55
July	11.25	11.30	12.50	35.25	29.00	23.95	35.75	12.75	19.25	20.60	16.40	17.12	16.39	13.75	12.80	14.00	13.50
Aug.	11.25	11.94	11.60	30.40	29.00	26.25	38.35	12.95	20.60	19.50	17.13	17.50	15.90	14.50	12.75	14.00	13.50
Sept.	11.06	11.86	11.69	31.87	29.00	24.90	37.69	14.19	23.75	19.75	18.20	17.70	15.25	14.25	13.31	14.00	13.50
Oct.	10.65	12.00	12.94	25.75	29.00	24.88	36.06	16.50	25.10	17.90	17.63	17.38	14.50	13.56	13.85	14.00	13.13
Nov.	9.81	13.31	17.30	28.15	29.00	28.63	31.95	16.60	24.63	17.88	18.63	18.31	14.50	13.25	14.25	13.88	12.13
Dec.	9.60	14.56	21.25	31.00	26.75	31.10	24.40	15.75	24.00	19.75	20.70	18.30	14.50	13.44	14.10	13.60	11.75
Aver.	*11.18*	*11.13*	*14.12*	*27.48*	*29.06*	*24.55*	*35.46*	*15.70*	*19.96*	*22.62*	*18.31*	*17.79*	*15.84*	*14.23*	*13.57*	*14.17*	*13.55*

No. 1 Railroad Wrought, at Chicago, per Net Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$8.70	$8.69	$15.88	$23.50	$31.25	$19.10	$26.00	$13.63	$10.50	$17.75	$15.31	$17.44	$13.50	$12.50	$11.10	$13.63	$12.00
Feb.	9.50	8.87	14.94	23.75	31.25	15.13	27.00	13.50	10.44	18.38	15.38	16.13	12.88	12.31	11.13	14.25	12.19
March	9.06	9.00	16.20	25.90	30.75	15.88	27.10	11.60	11.50	20.88	14.06	14.60	12.95	12.10	11.00	14.00	12.25
April	9.00	8.65	17.00	30.35	30.20	16.05	27.25	10.00	12.13	20.00	12.75	13.00	12.44	12.39	11.25	14.15	11.95
May	9.00	8.94	16.50	32.60	29.75	15.69	26.38	10.40	12.90	17.60	12.00	13.44	10.94	11.35	11.60	14.13	11.13
June	9.00	9.00	15.20	41.00	29.75	16.87	25.25	9.63	12.69	15.50	11.56	14.65	11.60	11.00	11.31	13.63	10.25
July	9.00	9.15	14.94	37.75	29.75	18.60	24.88	9.25	13.63	14.60	12.80	14.19	13.31	11.39	10.85	13.50	9.90
Aug.	8.94	10.44	15.30	33.70	29.75	20.75	24.75	10.45	14.75	14.25	13.75	16.00	13.50	11.70	11.06	13.88	9.75
Sept.	8.37	11.00	16.38	35.50	29.75	19.50	23.88	11.50	17.62	15.63	14.80	15.50	13.50	11.25	11.81	14.00	9.75
Oct.	7.87	11.19	17.50	28.75	30.36	19.38	20.25	13.00	17.75	13.20	14.25	14.38	12.81	10.19	12.60	13.70	9.19
Nov.	7.56	12.94	21.00	30.90	28.68	22.88	16.85	12.20	15.81	12.50	15.50	15.63	12.50	9.60	13.13	12.44	8.63
Dec.	7.90	15.38	25.13	31.25	24.62	24.10	14.60	10.44	15.13	15.00	16.81	13.95	12.00	10.44	13.25	12.00	8.50
Aver.	*8.66*	*10.27*	*17.16*	*31.25*	*29.66*	*18.66*	*23.68*	*11.30*	*13.74*	*16.27*	*14.08*	*14.91*	*12.66*	*11.35*	*11.67*	*13.80*	*10.46*

No. 1 Machinery Cast Scrap, at Chicago, per Net Ton

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$10.20	$9.19	$13.31	$15.50	$25.90	$22.95	$37.25	$17.25	$12.90	$21.60	$20.38	$19.88	$17.00	$16.50	$14.50	$15.81	$13.50
Feb.	10.87	9.00	12.81	15.37	26.06	20.00	38.88	18.00	13.25	23.63	21.00	18.75	17.00	16.50	14.50	16.25	13.75
March	10.37	9.00	13.45	16.90	27.25	21.63	37.85	14.90	14.13	26.25	20.13	18.20	17.00	16.50	14.50	16.00	13.75
April	10.25	9.00	12.88	20.43	27.12	21.45	37.25	13.25	14.88	25.75	18.40	17.25	16.39	16.50	14.13	16.00	13.50
May	10.06	9.00	12.56	23.20	26.70	20.12	37.38	13.60	16.20	23.30	17.38	16.88	15.88	15.80	14.00	15.39	12.88
June	9.75	9.00	11.75	30.00	27.12	20.75	36.30	12.75	16.06	21.75	16.75	17.50	16.15	14.50	13.88	14.75	12.50
July	9.65	9.25	11.50	29.25	28.06	23.30	36.50	12.25	17.00	19.60	16.90	17.50	17.19	14.50	13.50	14.50	12.00
Aug.	9.50	9.62	11.50	24.20	29.10	24.50	36.20	12.60	18.60	18.00	17.50	17.63	17.00	14.80	13.94	14.50	12.00
Sept.	9.19	10.10	12.13	23.75	30.00	24.20	34.00	13.44	21.38	19.63	18.20	17.90	16.88	14.56	14.81	14.50	11.40
Oct.	9.00	10.50	13.50	20.50	30.36	25.00	28.75	13.88	20.80	18.70	17.50	17.63	16.50	14.25	15.40	14.50	10.63
Nov.	8.56	12.13	15.55	22.00	28.87	28.12	23.00	13.50	20.25	18.38	17.88	18.19	16.00	13.50	15.50	13.63	9.63
Dec.	9.00	13.75	16.25	23.50	25.75	32.35	18.70	12.63	19.75	19.75	19.20	17.25	16.13	14.00	15.60	13.50	9.50
Aver.	*9.70*	*9.96*	*13.10*	*22.05*	*27.69*	*23.70*	*33.51*	*14.00*	*17.10*	*21.36*	*18.44*	*17.88*	*16.59*	*15.16*	*14.39*	*15.11*	*11.75*

Philadelphia Scrap Prices, Delivered Eastern Pennsylvania, Per Gross Ton

No. 1 Heavy Melting Steel

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$10.40	$10.00	$16.38	$21.70	$30.00	$17.20	$24.75	$14.50	$11.60	$19.70	$18.20	$18.50	$17.00	$15.39	$13.50	$16.39	$14.50
Feb.	11.00	10.00	16.50	20.63	30.00	14.75	25.62	14.25	12.00	20.75	18.38	17.63	15.88	14.63	13.50	16.39	14.63
March	11.31	10.80	16.90	23.50	29.00	14.19	25.20	13.00	12.78	25.25	16.75	15.90	16.00	14.50	13.50	16.13	14.88
April	10.95	11.00	17.88	24.88	28.00	15.50	24.12	11.25	14.00	23.63	15.30	14.63	16.00	14.50	13.50	17.00	13.95
May	10.63	11.25	16.60	25.40	29.00	15.00	23.37	11.80	14.75	19.80	14.75	14.63	15.25	14.10	13.50	16.39	13.39
June	10.50	11.10	15.31	34.13	29.00	16.12	22.60	11.25	15.00	17.88	15.00	15.10	14.70	14.00	13.39	16.00	12.75
July	10.30	12.06	14.94	35.20	29.00	18.90	22.62	11.00	15.00	16.60	15.40	15.63	14.63	13.39	13.00	16.50	12.50
Aug.	10.19	13.75	14.75	31.88	29.00	19.37	25.00	11.40	15.20	16.00	16.75	16.38	16.20	13.70	13.00	16.50	12.63
Sept.	10.69	15.00	14.75	30.25	29.00	18.62	25.62	11.50	16.88	16.75	17.10	17.20	16.88	14.00	14.75	16.39	13.00
Oct.	9.95	14.75	15.63	25.00	29.00	19.10	22.75	12.06	17.80	15.40	16.63	16.75	16.50	14.00	16.00	15.70	12.38
Nov.	9.25	14.65	20.13	26.00	28.00	20.62	19.00	11.88	16.25	15.25	17.75	17.38	15.50	13.80	15.50	15.00	11.75
Dec.	9.40	15.81	23.75	28.20	25.00	22.50	15.25	11.50	16.38	16.75	20.10	17.50	15.50	13.50	15.40	14.50	11.10
Aver.	*10.38*	*12.51*	*16.96*	*27.23*	*28.67*	*17.66*	*22.99*	*12.12*	*14.80*	*18.65*	*16.84*	*16.44*	*15.84*	*14.13*	*14.05*	*16.07*	*13.12*

No. 1 Machinery Cast

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$12.00	$12.00	$17.00	$20.20	$30.00	$23.80	$36.00	$23.25	$16.50	$23.20	$20.70	$20.13	$18.39	$17.00	$16.00	$16.31	$15.00
Feb.	12.88	12.00	17.00	20.00	30.00	23.00	40.00	23.00	16.50	24.25	20.25	18.88	17.75	17.00	16.00	16.50	15.00
March	13.00	12.00	17.00	21.75	30.00	21.25	39.20	19.40	17.13	28.25	18.63	18.00	17.50	17.00	16.00	16.25	15.00
April	13.00	11.75	17.88	26.63	29.00	22.00	38.00	18.00	17.25	26.25	17.70	17.25	17.50	17.00	16.00	16.50	14.85
May	12.25	12.13	17.50	29.00	29.00	21.50	37.75	18.00	18.40	24.30	17.60	17.00	17.25	16.80	16.00	16.50	14.00
June	12.00	12.25	16.50	33.50	29.00	22.00	37.00	17.38	19.00	22.25	17.50	17.50	17.00	16.00	16.00	16.50	13.50
July	12.00	12.38	16.00	36.30	29.00	22.10	37.50	16.50	17.50	20.40	17.50	17.63	17.00	16.00	15.50	16.50	13.00
Aug.	12.00	13.30	16.00	33.25	29.00	24.75	39.00	17.00	18.60	20.38	17.88	18.00	17.70	16.00	15.50	16.50	13.00
Sept.	12.00	14.00	16.00	31.00	29.00	25.00	39.25	17.00	21.50	21.38	18.00	18.00	18.00	16.38	16.25	16.88	13.00
Oct.	11.40	14.00	16.15	28.00	29.00	25.20	38.75	17.13	22.60	19.50	17.50	18.00	17.39	16.50	17.10	16.00	13.00
Nov.	11.00	14.50	18.50	30.00	29.00	27.62	33.80	17.50	21.00	19.25	17.88	18.00	17.30	16.13	16.39	15.88	12.00
Dec.	11.30	16.06	20.75	30.60	29.00	30.75	24.50	16.63	20.25	20.25	19.50	18.13	17.00	16.00	16.25	15.00	12.00
Aver.	*12.07*	*13.03*	*17.19*	*28.35*	*29.25*	*24.08*	*36.73*	*18.49*	*18.85*	*22.47*	*18.34*	*18.04*	*17.48*	*16.48*	*16.08*	*16.28*	*13.61*

No. 1 Railroad Wrought

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$13.05	$12.00	$22.00	$26.60	$35.00	$24.20	$33.50	$20.00	$14.50	$22.10	$20.90	$20.88	$18.39	$17.00	$15.25	$15.50	$15.00
Feb.	14.38	12.00	21.63	25.50	35.00	21.50	36.00	19.75	14.63	24.75	21.50	20.13	17.75	17.00	15.06	16.00	15.00
March	14.00	12.50	22.13	30.75	35.00	20.25	35.50	17.20	15.38	27.50	19.00	18.90	17.20	17.00	14.60	16.00	15.00
April	13.25	12.69	23.38	36.00	35.00	21.60	35.00	17.00	15.88	27.00	18.10	17.75	17.50	16.50	14.50	16.00	15.00
May	12.63	12.94	22.50	41.40	34.00	21.00	33.50	15.20	16.90	24.20	16.63	17.50	17.25	16.50	14.50	16.00	15.00
June	12.50	13.00	20.50	51.25	34.00	21.50	33.00	14.38	17.00	22.50	16.50	18.10	16.60	16.00	13.75	16.00	15.00
July	12.20	13.44	19.50	50.60	34.00	24.40	33.00	13.50	17.13	18.80	17.70	17.63	16.50	15.75	13.50	16.00	15.00
Aug.	12.00	14.95	20.20	45.00	34.00	26.50	33.00	14.00	18.00	18.00	18.63	17.50	17.80	15.50	13.50	16.00	15.00
Sept.	12.38	16.50	20.00	44.00	34.00	26.50	33.25	15.00	20.88	18.50	19.00	17.70	17.88	15.50	14.50	16.00	15.00
Oct.	11.80	16.13	21.63	37.20	34.00	26.90	29.25	15.88	22.20	17.50	18.00	18.13	17.00	15.50	15.60	16.00	14.75
Nov.	11.50	16.50	24.13	35.00	34.00	28.37	25.00	16.00	19.00	17.38	18.38	18.50	17.00	15.30	16.00	15.88	13.75
Dec.	11.50	20.06	26.75	35.00	33.00	30.25	20.00	14.63	19.25	18.50	20.40	18.50	17.00	15.25	16.00	15.40	13.50
Aver.	*12.60*	*14.39*	*22.03*	*38.19*	*34.25*	*24.41*	*31.70*	*16.04*	*17.56*	*21.39*	*18.73*	*18.44*	*17.32*	*16.07*	*14.73*	*15.90*	*14.75*

Old Cast Iron Carwheels

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$12.20	$11.00	$16.38	$21.50	$30.00	$24.60	$36.00	$25.00	$16.50	$22.30	$20.10	$19.50	$18.13	$16.38	$15.50	$16.50	$15.00
Feb.	12.63	10.63	16.50	20.50	30.00	23.00	40.62	24.00	15.00	24.75	20.38	18.38	17.50	16.00	15.50	16.50	15.00
March	12.50	11.00	16.70	21.50	30.00	23.00	42.40	18.50	15.94	26.50	18.75	18.50	17.50	16.00	15.50	16.50	15.00
April	12.00	11.00	17.38	25.75	29.00	23.10	40.00	18.00	15.88	26.50	17.50	17.75	17.50	16.00	15.50	16.50	15.00
May	11.75	11.38	16.70	28.00	29.00	21.00	40.00	16.80	16.70	24.20	17.00	17.00	17.25	16.00	15.50	16.39	14.88
June	11.19	11.55	16.38	34.00	29.00	22.00	38.00	18.00	17.13	22.75	17.00	17.00	17.00	15.38	15.50	16.00	14.50
July	11.00	12.38	15.63	36.20	29.00	23.20	38.50	16.50	17.50	20.40	17.30	17.25	17.00	15.00	15.50	16.39	14.50
Aug.	11.25	13.25	15.50	34.50	29.00	24.50	40.60	16.40	18.10	20.25	17.75	18.50	17.40	15.30	15.50	16.50	14.63
Sept.	11.25	14.00	15.50	32.50	29.00	24.50	42.75	17.00	21.75	21.00	18.60	18.50	17.50	15.50	15.88	16.50	15.00
Oct.	10.10	13.75	15.88	29.00	29.00	24.50	40.50	17.00	22.50	19.60	17.50	18.50	17.13	15.50	16.50	16.50	15.00
Nov.	9.50	14.05	18.88	31.25	29.00	27.75	36.40	17.20	20.50	17.75	17.88	18.50	16.60	15.50	16.50	15.75	14.38
Dec.	10.00	15.63	22.38	32.40	28.00	30.50	26.00	16.63	20.00	19.50	19.20	18.50	16.50	15.50	16.50	15.50	14.00
Aver.	*11.28*	*12.47*	*16.98*	*28.93*	*29.17*	*24.30*	*38.48*	*18.42*	*18.13*	*22.18*	*18.26*	*18.16*	*17.22*	*15.67*	*15.78*	*16.29*	*14.74*

Metals, Tin Plate and Galvanized Sheets for Seventeen Years

Copper at New York, Cents a Pound (Lake Copper through 1919; Electrolytic Copper, 1920 to Date)

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	14.85	14.02	24.39	29.73	23.50	20.48	19.27	12.95	13.55	14.52	12.46	14.73	13.84	12.99	13.85	16.59	17.75
Feb.	15.00	15.21	26.85	34.90	23.50	17.86	19.02	12.84	12.92	15.34	12.73	14.49	14.00	12.69	13.82	17.74	17.75
March	14.79	15.75	27.10	35.85	23.50	15.46	18.50	12.19	12.68	16.84	13.52	14.06	13.86	13.08	13.90	21.25	17.75
April	14.75	18.90	28.27	31.67	23.50	15.55	19.19	12.49	12.61	16.81	13.21	13.30	13.69	12.81	14.13	19.69	15.67
May	14.40	21.00	28.88	31.42	23.50	16.18	19.05	12.79	13.13	15.54	12.76	13.34	13.60	12.65	14.19	17.75	12.76
June	14.12	23.38	27.82	32.46	23.50	17.95	19.00	12.88	13.62	14.74	12.35	13.41	13.64	12.37	14.50	17.75	12.09
July	13.70	21.98	25.84	28.78	25.80	22.07	19.00	12.46	13.71	14.39	12.39	13.95	13.91	12.51	14.50	17.75	11.02
Aug.	12.85	19.33	26.95	27.24	26.00	23.16	19.00	11.70	13.74	13.87	13.26	14.48	14.19	13.00	14.50	17.75	10.65
Sept.	12.66	17.97	28.03	24.90	26.00	22.68	18.70	12.01	13.75	13.36	12.97	14.42	14.05	12.93	14.70	17.75	10.39
Oct.	11.73	17.89	28.48	23.50	26.00	22.13	16.56	12.67	13.66	12.58	12.96	14.29	13.88	12.98	15.16	17.75	9.60
Nov.	12.00	18.92	22.32	23.50	26.00	20.69	14.63	13.07	13.62	12.76	13.59	14.36	13.59	13.34	15.75	17.75	10.17
Dec.	13.35	20.24	33.38	23.50	25.40	18.90	13.63	13.55	14.00	12.88	14.23	13.82	13.31	13.79	15.84	17.75	10.29
Aver.	*13.68*	*18.72*	*28.19*	*28.95*	*24.68*	*19.43*	*17.96*	*12.63*	*13.42*	*14.47*	*13.04*	*14.05*	*13.80*	*12.93*	*14.57*	*18.11*	*12.99*

Spelter (Zinc) at New York, Cents a Pound

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	7.15	5.29	6.59	18.19	9.94	7.88	7.38	9.62	5.83	5.06	7.28	6.78	8.10	8.75	7.03	6.00	6.70	5.59
Feb.	6.45	5.40	8.84	20.13	10.48	7.99	6.70	9.14	5.36	4.85	7.58	7.11	7.86	8.16	7.04	5.90	6.70	4.53
March	6.28	5.28	9.29	18.40	10.77	7.64	6.52	8.93	5.20	5.00	8.19	6.85	7.68	7.69	7.06	5.98	6.80	5.30
April	5.77	5.18	11.22	18.58	9.85	7.01	6.51	8.63	5.24	5.25	7.65	6.49	7.35	7.36	6.69	6.11	7.04	5.19
May	5.47	5.06	16.14	15.86	9.46	7.32	6.46	8.08	5.28	5.45	6.99	6.13	7.30	7.16	6.43	6.37	6.98	4.98
June	5.18	5.09	22.18	12.75	9.62	8.01	6.93	7.92	4.95	5.69	6.40	6.14	7.35	7.47	6.57	6.50	7.00	4.79
July	5.38	5.02	20.58	9.83	8.95	8.69	7.90	8.18	4.77	6.12	6.43	6.25	7.60	7.76	6.58	6.55	7.10	4.66
Aug.	5.75	5.60	14.11	8.98	8.69	8.96	7.84	8.31	4.69	6.59	6.68	6.53	7.55	7.69	6.70	6.59	7.15	4.72
Sept.	5.82	5.50	14.16	8.22	8.34	9.60	7.57	7.82	4.74	6.91	6.81	6.54	8.12	7.76	6.56	6.60	7.15	4.62
Oct.	5.42	4.97	13.96	9.98	8.24	9.11	7.83	7.51	5.10	7.20	6.66	6.67	8.65	7.66	6.35	6.60	7.09	4.40
Nov.	5.29	5.12	17.15	11.90	7.95	8.70	8.14	6.84	5.18	7.48	6.70	7.14	9.04	7.56	6.09	6.62	6.63	4.63
Dec.	5.18	5.71	16.69	11.13	7.84	8.45	8.59	6.00	5.25	7.46	6.60	7.73	8.97	7.39	6.15	6.70	6.09	4.43
Aver.	*5.76*	*5.27*	*14.24*	*13.66*	*9.18*	*8.28*	*7.36*	*8.08*	*5.13*	*6.09*	*7.00*	*6.70*	*7.96*	*7.70*	*6.60*	*6.39*	*6.87*	*4.82*

Lead, at New York, Cents a Pound

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	4.35	4.11	3.74	5.93	7.69	6.87	5.56	8.67	5.00	4.70	7.85	8.31	10.26	9.25	7.59	6.50	6.65	6.25
Feb.	4.35	4.06	3.82	6.23	9.13	7.04	5.05	8.88	4.54	4.70	8.14	9.01	9.38	9.08	7.40	6.34	6.85	6.24
March	4.35	3.97	4.04	7.43	9.47	7.24	5.23	9.21	4.08	4.71	8.47	9.23	8.90	8.46	7.57	6.00	7.41	5.66
April	4.40	3.82	4.20	7.73	9.43	6.95	5.03	8.95	4.33	5.13	8.19	8.19	8.01	7.91	7.10	6.10	7.19	5.58
May	4.37	3.90	4.25	7.45	11.00	6.88	5.05	8.55	4.99	5.51	7.39	7.27	8.08	7.75	6.60	6.13	7.00	5.51
June	4.35	3.90	5.89	6.87	11.68	7.55	5.34	8.48	4.56	5.73	7.14	7.08	8.35	8.08	6.42	6.30	7.00	5.41
July	4.37	3.90	5.59	6.34	10.72	8.04	5.65	8.67	4.40	5.75	6.28	7.15	8.33	8.60	6.33	6.22	6.80	5.25
Aug.	4.64	3.87	4.68	6.26	10.72	8.05	5.77	8.98	4.40	5.88	6.74	8.02	9.52	8.96	6.69	6.25	6.75	5.49
Sept.	4.73	3.86	4.62	6.88	8.84	8.05	6.12	8.11	4.60	6.20	7.06	8.09	9.60	8.80	6.30	6.45	6.88	5.50
Oct.	4.52	3.52	4.60	7.00	6.77	8.05	6.45	7.24	4.70	6.67	6.84	8.31	9.62	8.40	6.25	6.50	6.87	5.17
Nov.	4.33	3.68	5.16	7.13	6.44	8.05	6.76	6.33	4.70	7.20	6.87	8.96	9.84	8.00	6.27	6.39	6.29	5.10
Dec.	4.06	3.80	5.33	7.60	6.48	6.71	7.03	4.80	4.70	7.28	7.61	9.61	9.36	7.87	6.52	6.49	6.25	5.10
Aver.	*4.40*	*3.87*	*4.66*	*6.90*	*9.03*	*7.46*	*5.76*	*8.07*	*4.58*	*5.79*	*7.39*	*8.27*	*9.10*	*8.39*	*6.75*	*6.31*	*6.83*	*5.52*

Straits Tin, at New York, Cents a Pound

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	39.12	34.13	41.76	44.10	85.13	71.50	62.74	35.94	32.03	39.16	48.70	58.26	62.20	66.43	55.56	49.21	38.84
Feb.	39.82	37.25	42.60	51.47	85.00	72.45	59.87	32.16	30.74	41.98	53.41	57.09	63.65	69.05	52.47	49.39	38.63
March	38.03	48.73	50.53	58.38	85.00	72.50	61.93	28.79	29.14	48.61	55.03	53.67	64.47	69.23	52.11	48.85	36.76
April	36.10	47.64	51.51	55.82	88.53	72.50	62.12	30.36	30.58	45.84	50.02	52.27	63.35	67.88	52.28	45.93	35.90
May	33.21	38.79	49.14	63.21	100.00	72.50	54.99	32.50	30.92	43.11	44.08	54.65	62.36	67.47	51.53	43.88	32.16
June	30.60	40.26	42.07	61.93	91.00	71.83	48.34	29.39	31.46	40.97	42.74	55.93	60.63	67.42	47.92	44.20	30.26
July	35.65	37.38	38.25	61.61	93.00	70.11	49.29	27.69	31.67	38.47	46.29	58.05	62.98	64.01	47.01	46.29	29.76
Aug.	48.34	34.37	38.88	62.53	91.33	62.20	47.60	26.35	32.36	39.33	51.89	58.12	65.17	64.41	47.97	46.60	30.00
Sept.	31.13	33.13	38.65	61.54	80.40	59.79	44.43	26.70	32.36	41.60	49.24	58.27	68.89	61.43	48.06	45.32	29.59
Oct.	30.25	33.05	41.10	62.24	78.82	54.82	40.47	27.70	34.61	41.80	50.60	62.24	70.36	58.49	48.99	42.25	26.76
Nov.	33.28	39.50	44.12	74.18	73.67	54.17	36.97	28.93	36.76	44.09	54.25	63.30	70.75	57.49	50.76	40.18	25.87
Dec.	34.01	38.53	42.55	84.74	71.51	53.80	34.04	32.41	37.48	47.16	56.03	62.94	68.68	58.54	50.23	39.87	25.01
Aver.	*35.80*	*38.56*	*43.43*	*61.90*	*85.28*	*65.68*	*50.23*	*29.91*	*32.51*	*42.68*	*50.19*	*57.90*	*64.29*	*64.32*	*50.39*	*45.16*	*31.63*

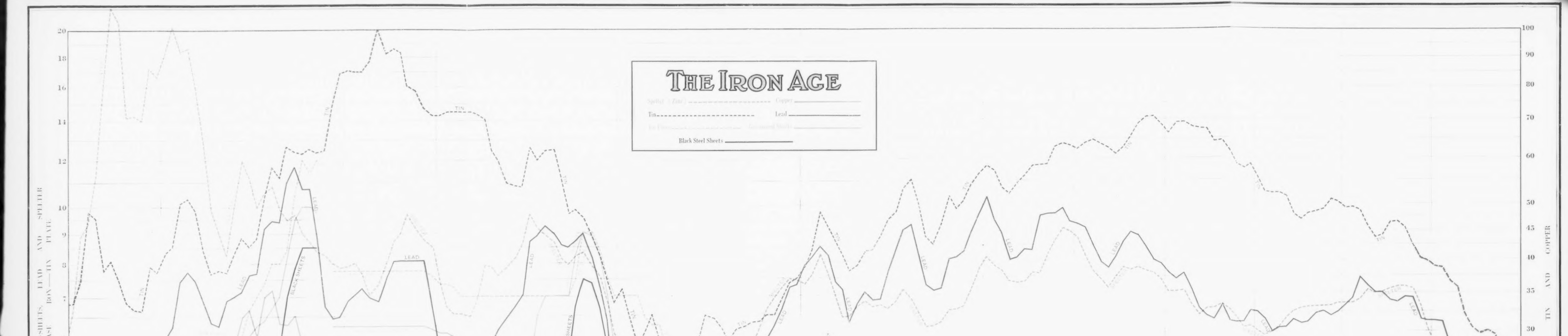
Tin Plate, at Pittsburgh, Dollars a Base Box

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	$3.60	$3.32	$3.10	$3.75	$7.00	$7.75	$7.35	$7.00	$7.00	$4.75	$4.75	$5.50	$5.50	$5.50	$5.50	$5.25	$5.35	$5.25
Feb.	3.60	3.29	3.10	3.96	7.38	7.75	7.35	7.00	7.00	4.71	4.80	5.50	5.50	5.50	5.50	5.25	5.35	5.25
March	3.60	3.30	3.25	4.19	8.00	7.75	7.26	7.00	7.00	4.60	5.23	5.50	5.50	5.50	5.50	5.25	5.35	5.25
April	3.60	3.30	3.25	4.50	8.00	7.75	7.00	7.00	6.44	4.75	6.00	5.50	5.50	5.50	5.50	5.25	5.35	5.25
May	3.60	3.30	3.15	5.30	8.40	7.75	7.00	7.00	6.25	4.75	5.70	5.50	5.50	5.50	5.50	5.25	5.35	5.25
June	3.60	3.30	3.11	5.81	10.50	7.75	7.00	7.00	6.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25
July	3.60	3.27	3.10	6.00	12.00	7.75	7.00	7.50	5.69	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25
Aug.	3.55	3.41	3.10	5.95	11.40	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25
Sept.	3.50	3.35	3.15	5.75	12.00	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.25
Oct.	3.50	3.24	3.15	5.81	...	7.75	7.00	8.33	5.13	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.00
Nov.	3.40	3.15	3.28	5.97	7.75	7.75	7.00	7.50	4.75	4.75	5.50	5.50	5.50	5.50	5.50	5.25	5.35	5.00
Dec.	3.40	3.13	3.52	6.63	7.75	7.55	7.00	7.00	4.73	4.75	5.50	5.50	5.50	5.50	5.25	5.25	5.35	5.00
Aver.	*3.55*	*3.28*	*3.19*	*5.30*	*9.11*	*7.73*	*7.08*	*7.53*	*5.90*	*4.73*	*5.42*	*5.50*	*5.50*	*5.50*	*5.48*	*5.25*	*5.35*	*5.19*

No. 28 Gage Galvanized Sheets, at Pittsburgh, Cents a Pound

(While No. 24 gage was made the base in 1926, this table is continued at No. 28 gage, to preserve comparisons with past years)

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	3.46	2.87	2.79	4.75	6.25	6.25	6.05	5.33	5.70	4.00	4.35	4.98	4.75	4.60	4.28	4.15	4.10	3.83
Feb.	3.50	2.95	3.16	4.75	6.38	6.25	6.05	6.50	5.56	4.00	4.54	5.00	4.75	4.53	4.21	4.15	4.10	3.80
March	3.50	2.95	3.40	4.75	6.69	6.25	5.96	7.00	5.05	4.00	4.93	4.93	4.62	4.50	4.15	4.15	4.10	3.80
April	3.50	2.91	3.29	5.00	7.00	6.25	5.70	7.00	4.88	4.11	5.25	4.88	4.45	4.50	4.13	4.15	4.10	3.80
May	3.42	2.80	3.50	4.94	8.20	6.25	5.70	7.00	5.00	4.15	5.20	4.80	4.29	4.43	4.22	4.08	4.10	3.73
June	3.38	2.75	4.28	4.69	9.50	6.25	5.70	7.00	4.88	4.15	5.00	4.76	4.21	4.28	4.35	4.00	4.10	3.69
July	3.33	2.75	4.40	4.38	10.00	6.25	5.70	8.25	4.31	4.15	5.00	4.56	4.19	4.24	4.35	3.96	4.10	3.63
Aug.	3.24	2.85	3.71	4.21	10.00	6.25	5.70	9.00	3.90	4.23	5.00	5.55	4.20	4.23	4.35	3.90	4.00	3.55
Sept.	3.16	2.95	3.56	4.18	9.75	6.25	5.70	8.88	3.81	4.35	5.00	4.60	4.20	4.33	4.35	3.90	4.00	3.50
Oct.	3.08	2.95	3.50	4.41	...	6.25	5.70	8.18	4.00	4.50	5.00	4.60	4.23	4.35	4.26	4.00	4.00	3.49
Nov.	2.98	2.88	3.89	5.18	6.25	6.25	5.70	7.04	3.86	4.43	4.93	4.60	4.50	4.35	4.16	4.00	3.98	3.45
Dec.	2.90	2.78	4.75	6.00	6.25	6.15	5.70	5.70	4.00	4.35	4.89	4.72	4.60	4.35	4.13	4.08	3.90	3.42
Aver.	*3.29*	*2.87*	*3.69*	*4.77*	*7.84*	*6.24*	*5.78*	*7.24*	*4.58*	*4.20*	*4.92*	*4.75*	*4.42*	*4.39*	*4.25*	*4.04*	*4.05*	*3.64*


THE IRON AGE
Spelter (Zinc)
Copper
Tin
Lead
Ingot Iron
Galvanized Sheets
Black Steel Sheets
BLACK SHEETS, LEAD AND SPELTER
GALVANIZED SHEETS—TIN PLATE
TIN AND COPPER
TIN
LEAD
BLACK SHEETS
GALV. SHEETS
SPELTER
COPPER
20
18
16
14
12
10
9
8
100
90
80
70
60
50
45
40
35
30

Carload Prices of Copper, Lead, Tin and Zinc in New York, and of Tin Plate and Black and Galvanized Sheets in Pittsburgh

Production of Iron and Steel and of Commodities Made from Them

Steel Ingots Made in the United States

(THE IRON AGE *figures prior to June, 1917; American Iron and Steel Institute figures since then*)

(Thousands of Gross Tons)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1899.....	801	718	822	796	874	862	4,873	856	932	917	950	980	951	*5,586	*10,459
1900.....	979	868	962	893	977	921	*5,600	798	775	685	712	698	727	4,395	9,995
1901.....	*1,009	968	*1,069	*1,085	*1,162	1,094	*6,388	1,136	1,159	1,079	*1,200	1,176	1,018	*6,768	*13,156
1902.....	*1,223	1,060	1,192	*1,256	*1,321	1,185	*7,237	1,189	1,211	1,209	1,268	1,174	1,268	*7,319	*14,556
1903.....	1,217	1,131	1,265	*1,322	*1,363	*1,376	*7,674	1,230	1,250	1,277	1,178	822	674	6,431	14,105
1904.....	759	1,020	1,239	1,325	1,263	1,100	6,706	885	1,001	1,153	1,196	1,262	1,327	6,824	13,530
1905.....	*1,516	1,389	*1,710	1,624	*1,735	1,576	*9,550	1,425	1,629	1,670	*1,746	*1,770	1,673	*9,913	*19,463
1906.....	*1,928	1,746	*2,018	1,848	1,956	1,833	*11,329	1,739	1,794	1,757	*2,047	2,029	1,929	11,295	*22,624
1907.....	2,005	1,830	1,949	2,007	*2,087	1,944	*11,822	1,975	2,046	1,899	*2,124	1,654	1,039	10,737	22,559
1908.....	934	954	1,057	1,023	1,004	972	5,944	1,049	1,171	1,263	1,401	1,350	1,499	7,733	13,677
1909.....	1,623	1,575	1,722	1,622	1,700	1,801	10,043	1,899	2,030	*2,225	*2,347	*2,376	*2,379	13,256	*23,299
1910.....	*2,404	2,257	*2,506	2,365	2,203	2,157	*13,892	1,904	2,016	1,956	1,929	1,818	1,639	11,262	*25,154
1911.....	1,716	1,788	2,199	2,001	1,918	1,801	11,423	1,682	1,951	1,992	2,050	2,015	1,916	11,606	23,029
1912.....	2,169	2,191	2,441	2,491	*2,648	2,461	*14,401	2,445	2,648	2,484	*2,833	2,759	2,715	*15,884	*30,285
1913.....	2,814	2,562	2,679	2,757	*2,841	2,532	*16,185	2,482	2,466	2,510	2,563	2,151	1,923	14,095	30,280
1914.....	1,907	1,881	2,287	2,285	2,039	1,930	12,329	1,907	1,944	1,895	1,799	1,470	1,476	10,491	22,820
1915.....	1,663	1,777	2,226	2,271	2,351	2,555	12,843	2,662	*2,887	*3,061	*3,246	*3,259	*3,326	*18,441	*31,284
1916.....	*3,333	3,321	*3,627	3,356	*3,652	3,473	*20,762	3,245	3,481	3,463	*3,672	3,581	3,198	20,640	*41,402
1917.....	*3,743	3,093	*3,864	3,792	*4,061	3,617	*22,170	3,447	3,663	3,486	3,932	3,714	3,207	21,449	*43,619
1918.....	2,641	2,725	3,728	3,791	3,939	3,696	20,520	3,732	3,696	3,832	4,017	3,668	3,586	*22,531	43,051
1919.....	3,651	3,178	3,128	2,631	2,266	2,607	17,461	2,947	3,226	2,718	2,046	2,513	2,784	16,234	33,695
1920.....	3,524	3,402	3,917	3,132	3,423	3,539	20,937	3,328	3,562	3,561	3,581	3,133	2,779	19,944	40,881
1921.....	2,517	1,999	1,795	1,387	1,446	1,146	10,290	918	1,300	1,342	1,847	1,897	1,630	8,934	19,224
1922.....	1,893	2,071	2,814	2,902	3,219	3,128	16,027	2,953	2,629	2,818	3,410	3,430	3,301	18,541	34,568
1923.....	3,841	3,472	*4,067	3,964	*4,216	3,767	*23,327	3,531	3,696	3,357	3,577	3,134	2,863	20,159	43,486
1924.....	3,650	3,826	4,207	3,348	2,640	2,066	19,737	1,878	2,553	2,828	3,125	3,121	3,569	17,074	36,811
1925.....	4,193	3,752	4,194	3,584	3,455	3,205	22,383	3,084	3,421	3,490	3,889	3,903	3,971	21,758	*44,141
1926.....	4,132	3,785	*4,469	4,106	3,928	3,734	*24,154	3,635	3,987	3,913	4,074	3,706	3,467	22,782	*46,936
1927.....	3,823	3,845	*4,575	4,163	4,083	3,526	24,015	3,232	3,529	3,298	3,345	3,155	3,203	19,762	43,777
1928.....	4,028	4,081	4,549	4,345	4,246	3,778	*25,027	3,841	4,217	4,186	*4,693	4,306	4,055	*25,298	*50,325
1929.....	4,545	4,372	*5,118	4,999	*5,339	4,951	*29,324	4,898	4,988	4,573	4,579	3,556	2,932	25,526	*54,850
1930.....	3,796	4,078	4,300	4,154	4,025	3,440	23,793	2,933	3,095	2,868	2,720	2,234	.....	†15,944	†39,739

Asterisks denote high records. Figures for 1930 are preliminary and do not include electric and crucible ingots.
†Estimated, as to December.

Steel Ingots Made in the United States

(Gross Tons a Day)

	Jan.	Feb.	March	April	May	June	First Half	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1899	30,791	29,899	30,442	31,843	*32,376	*33,169	31,439	*34,246	*34,531	*35,254	*36,557	*37,680	*38,031	*36,039	*33,739
1900	36,244	36,173	35,648	35,732	36,180	35,422	35,899	31,929	28,719	27,394	26,384	26,831	29,071	28,356	32,139
1901	37,364	40,342	41,126	41,746	*43,051	*43,759	*41,213	43,702	42,939	43,174	*44,427	*45,235	40,699	*43,384	*42,303
1902	*45,284	44,164	*45,834	*48,321	*48,939	47,419	*46,693	45,735	46,569	46,497	46,974	46,961	48,760	*46,916	*46,805
1903	45,066	47,111	48,668	*50,857	*52,436	*52,906	*49,510	47,313	48,075	49,128	43,624	32,872	25,909	41,222	45,353
1904	29,186	40,817	45,863	50,973	48,567	42,309	42,985	35,416	37,057	44,339	45,985	48,542	51,064	43,744	43,364
1905	*58,298	57,860	*63,349	*64,980	64,248	60,624	*61,614	56,993	60,320	64,142	*67,174	*68,077	66,931	*63,954	*62,784
1906	*71,406	*72,758	*74,746	73,942	72,439	70,500	*72,626	69,491	66,501	70,295	*75,823	*78,023	77,151	*72,869	*72,747
1907	74,265	76,239	74,967	77,216	77,293	77,749	*76,272	75,950	75,774	75,971	*78,689	63,607	41,559	68,828	72,539
1908	34,617	38,153	40,675	39,342	38,605	37,375	38,105	40,342	45,034	48,561	51,903	53,997	57,654	49,568	43,839
1909	62,412	65,630	63,753	62,387	65,390	69,273	64,791	73,031	78,084	*85,576	*90,256	*91,398	*91,511	*84,976	*74,916
1910	*92,462	*94,024	92,804	90,097	84,720	82,977	*89,624	76,152	74,678	75,242	74,191	69,946	63,015	72,195	*80,881
1911	65,991	74,524	81,441	80,042	71,023	69,285	73,698	67,257	72,268	76,632	78,851	77,498	76,642	74,880	74,289
1912	80,320	87,650	93,879	*95,803	*98,066	*98,439	*92,310	94,057	98,060	*99,369	*104,927	*106,107	*108,610	*101,823	*97,066
1913	104,218	106,757	103,034	106,052	105,220	101,268	*104,419	95,468	94,839	96,543	94,927	86,051	73,954	90,362	*97,364
1914	70,630	78,348	87,972	87,887	78,410	74,239	79,539	73,350	74,759	72,889	66,626	58,786	56,794	67,251	73,376
1915	63,964	74,060	82,432	87,354	90,406	98,264	82,877	102,387	*111,023	*117,733	*124,839	*125,359	*127,946	*118,214	*100,592
1916	*128,195	*132,824	*134,334	134,239	*135,277	133,563	*133,089	129,780	128,943	133,184	*141,224	137,739	127,934	*133,162	*133,125
1917	138,629	128,891	*143,093	*151,665	150,400	139,129	*142,113	137,900	135,683	139,455	145,619	142,843	128,263	138,384	140,255
1918	97,822	113,539	143,370	145,815	145,910	147,814	132,322	143,520	136,875	*153,289	148,794	141,083	143,445	*144,430	138,425
1919	135,224	132,396	120,295	101,202	83,935	104,287	112,651	113,332	124,082	104,539	75,779	100,523	107,077	104,064	108,343
1920	130,519	141,739	145,073	120,480	131,661	136,114	134,213	127,992	137,016	136,976	137,726	120,496	106,874	127,846	131,030
1921	96,810	83,279	66,473	53,342	55,622	44,090	66,387	36,713	48,156	51,619	71,044	72,942	62,707	57,270	61,814
1922	72,764	86,324	104,247	116,090	119,215	120,299	103,401	118,112	97,380	108,395	131,164	131,935	132,017	119,621	111,511
1923	142,263	144,660	150,618	*158,549	156,161	144,894	*149,532	141,258	136,881	134,271	132,485	120,551	114,531	130,056	139,825
1924	135,182	153,050	*161,796	128,787	97,779	82,627	126,519	72,223	98,188	108,755	115,756	124,846	137,279	109,449	117,984
1925	155,307	156,348	161,321	137,834	132,883	123,248	144,407	118,634	131,577	134,214	144,030	156,116	152,728	139,472	*141,932
1926	158,931	157,710	*165,504	157,915	151,076	143,621	*155,831	139,807	153,347	150,515	156,713	142,529	133,339	146,039	*150,929
1927	147,039	160,222	*169,439	160,130	157,023	135,621	154,939	129,285	130,707	126,824	128,664	121,320	123,201	126,676	140,761
1928	154,913	163,231	168,475	*173,805	157,298	145,325	*160,429	153,629	156,192	167,447	*173,810	165,624	162,212	*163,209	*161,818
1929	168,323	*182,150	*196,861	192,273	*197,727	*198,062	*189,187	188,409	184,742	182,910	169,602	136,769	117,271	163,631	*176,368
1930(a)	140,596	169,930	165,381	159,764	149,066	137,610	153,505	112,823	119,050	110,307	100,756	89,379	.....	†102,200	†127,739

Asterisks show new high records.
(a) Figures for 1930 do not include electric and crucible steel ingots.
†With December estimated.

Steel Castings Orders in the United States

(From United States Department of Commerce)

(Net Tons)

	Jan.	Feb.	March	April	May	June	Half-Year	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1920	80,663	85,326	125,952	99,201	97,652	85,795	574,589	78,858	76,932	78,267	56,757	49,668	42,368	382,850	957,439
1921	34,401	33,906	29,260	24,512	23,311	23,739	169,129	20,177	23,327	27,822	38,105	47,286	37,200	193,917	363,046
1922	43,230	46,520	60,080	94,920	97,350	112,120	454,220	83,010	79,560	122,840	94,980	76,400	86,420	543,210	997,430
1923	133,580	117,800	190,030	121,750	120,210	114,820	798,190	70,630	68,660	64,240	51,560	54,620	55,610	365,320	1,163,510
1924	66,360	94,390	129,740	87,930	73,330	62,880	514,630	49,300	46,940	80,690	86,080	95,810	124,130	482,950	997,580
1925	107,170	83,070	82,020	80,940	69,300	68,080	490,580	73,710	69,060	64,420	80,660	90,330	108,979	487,159	977,739
1926	113,223	99,333	113,143	92,694	84,161	72,739	575,293	79,443	70,962	69,495	77,549	73,234	89,805	460,488	1,035,781
1927	108,063	94,939	90,353	81,403	73,043	91,199	539,000	74,569	63,939	52,742	52,160	63,075	77,346	383,831	922,831
1928	91,448	91,076	83,755	84,086	86,796	72,107	509,268	66,992	81,286	82,762	78,860	84,742	96,373	491,015	1,000,283
1929	124,313	115,639	130,836	144,616	113,329	95,201	723,934	103,356	101,777	86,584	136,208	97,888	90,287	616,100	1,340,034
1930	101,728	114,727	122,658	93,200	91,307	61,358	584,978	58,069	50,516	49,639	45,549	.....	.....	295,000(a)	880,000

(a) With November and December estimated.

Pig Iron Production of the United States

(THE IRON AGE *figures, including ferroalloys made in blast furnaces, but excluding charcoal iron*)

(Thousands of Gross Tons)

	Jan.	Feb.	March	April	May	June	First Half	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1884	308	289	311	302	313	299	1,822	342	321	297	307	304	296	1,867	3,689
1885	278	275	313	297	302	286	1,751	308	305	294	315	333	382	1,937	3,688
1886	368	334	397	*428	*465	455	2,447	*473	460	448	*477	471	*497	*2,826	*5,273
1887	493	463	*522	513	454	359	2,804	413	486	*531	*569	550	548	*3,097	*5,901
1888	507	424	447	453	483	457	2,771	464	492	500	546	566	*616	*3,184	*5,955
1889	601	535	594	564	557	533	*3,384	562	566	564	*626	*642	*684	*3,644	*7,028
1890	*709	653	*734	713	*739	701	*4,249	712	703	706	*742	730	733	*4,326	*8,575
1891	612	492	481	429	512	607	3,133	731	728	726	*789	784	*812	*4,570	7,703
1892	784	745	792	736	732	690	4,479	690	651	635	700	717	747	4,140	*8,619
1893	728	665	754	739	755	674	4,315	564	407	322	326	373	431	2,423	6,738
1894	445	426	534	517	386	319	2,627	441	584	640	691	708	744	3,808	6,435
1895	706	617	672	648	668	679	3,990	776	*827	*845	*923	*926	*934	*5,231	*9,221
1896	873	779	810	785	799	751	4,797	721	608	491	499	550	647	3,516	8,313
1897	702	654	747	728	746	710	4,287	719	764	813	901	927	*986	5,110	*9,397
1898	974	895	*1,000	965	978	910	*5,722	924	915	907	974	985	*1,050	*5,755	*11,477
1899	1,033	906	1,022	1,034	*1,086	1,077	*6,158	*1,149	*1,159	1,145	*1,226	1,223	*1,276	*7,178	*13,336
1900	*1,285	1,158	1,264	1,226	1,282	1,215	*7,430	1,132	1,018	939	935	920	1,031	5,975	*13,405
1901	1,162	1,134	1,279	1,257	*1,339	1,318	*7,489	*1,360	1,336	1,300	*1,382	1,362	1,266	*8,006	*15,495
1902	*1,428	1,258	*1,445	*1,475	*1,543	1,447	*8,595	1,442	1,468	1,419	1,481	1,433	1,537	*8,780	*17,375
1903	1,473	1,391	*1,590	*1,608	*1,714	1,673	*9,449	1,546	1,571	1,554	1,426	1,039	847	7,983	17,432
1904	924	1,208	1,451	1,561	1,537	1,296	7,977	1,121	1,173	1,358	1,455	1,487	1,616	8,210	16,187
1905	*1,782	1,597	*1,936	1,922	*1,964	1,793	*10,994	1,742	1,844	1,899	*2,053	2,014	2,046	*11,598	*22,592
1906	*2,069	1,904	*2,165	2,073	2,097	1,977	*12,287	2,013	1,927	1,971	*2,197	2,188	*2,235	*12,531	*24,818
1907	2,206	2,045	2,226	2,219	*2,295	2,235	*13,226	2,256	2,250	2,184	*2,337	1,828	1,234	12,089	*25,315
1908	1,045	1,078	1,228	1,150	1,166	1,092	6,759	1,218	1,360	1,419	1,567	1,578	1,741	8,883	15,642
1909	1,798	1,707	1,836	1,739	1,883	1,931	10,894	2,103	2,249	*2,385	*2,600	2,547	*2,636	*14,520	*25,414
1910	2,609	2,397	2,618	2,484	2,390	2,265	*14,763	2,149	2,107	2,056	2,093	1,910	1,778	12,093	*26,856
1911	1,759	1,795	2,171	2,065	1,893	1,788	11,477	1,793	1,927	1,977	2,102	2,000	2,043	11,842	23,313
1912	2,058	2,101	2,405	2,375	2,513	2,441	13,893	2,411	2,512	2,464	*2,690	2,631	*2,782	*15,490	*29,383
1913	*2,795	2,586	2,764	2,753	*2,822	2,629	*16,349	2,561	2,546	2,506	2,546	2,233	1,984	14,376	*30,725
1914	1,885	1,888	2,348	2,270	2,093	1,918	12,402	1,958	1,995	1,883	1,778	1,518	1,516	10,648	23,050
1915	1,601	1,675	2,064	2,117	2,263	2,381	12,101	2,563	2,780	*2,853	*3,126	3,037	*3,203	*17,562	29,663
1916	3,185	3,087	*3,339	3,227	*3,361	3,211	*19,410	3,224	3,204	3,202	*3,509	3,312	3,178	*19,629	*39,039
1917	3,151	2,645	3,252	3,335	3,417	3,270	19,070	3,342	3,248	3,184	3,303	3,206	2,883	19,116	38,186
1918	2,412	2,319	3,213	3,288	3,447	3,324	18,003	3,421	3,389	3,418	3,487	3,354	3,434	20,503	38,506
1919	3,303	2,940	3,090	2,478	2,108	2,115	16,034	2,429	2,743	2,488	1,864	2,392	2,633	14,549	30,583
1920	3,015	2,979	3,376	2,739	2,986	3,044	18,139	3,067	3,147	3,129	3,293	2,935	2,704	18,275	36,414
1921	2,416	1,937	1,596	1,193	1,221	1,065	9,428	865	954	986	1,247	1,415	1,649	7,116	16,544
1922	1,645	1,630	2,036	2,072	2,306	2,361	12,050	2,405	1,816	2,034	2,639	2,849	3,087	14,830	26,880
1923	3,229	2,994	*3,524	*3,550	*3,868	3,676	*20,841	3,678	3,450	3,126	3,149	2,894	2,921	19,218	*40,059
1924	3,019	3,075	3,466	3,233	2,615	2,026	17,434	1,785	1,887	2,053	2,477	2,510	2,962	13,674	31,108
1925	3,370	3,214	3,564	3,259	2,931	2,674	19,012	2,664	2,705	2,726	3,023	3,023	3,250	17,391	36,403
1926	3,316	2,923	3,442	3,450	3,482	3,235	19,848	3,223	3,201	3,136	3,331	3,237	3,091	19,222	39,070
1927	3,104	2,941	3,483	3,422	3,391	3,090	19,431	2,951	2,947	2,775	2,784	2,648	2,696	16,801	36,232
1928	2,870	2,900	3,200	3,185	3,284	3,082	18,521	3,072	3,137	3,062	3,374	3,302	3,370	19,317	37,838
1929	3,442	3,206	3,714	3,663	*3,898	3,717	*21,621	3,785	3,756	3,498	3,588	3,181	2,837	20,665	*42,286
1930	2,827	2,839	3,246	3,182	3,233	2,934	18,261	2,639	2,524	2,277	2,165	1,867	.....	†13,239	†31,500

*High records for periods specified.
†Estimated, as to December.

Pig Iron Made in the United States

(Gross Tons a Day)

	Jan.	Feb.	March	April	May	June	First Half	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1884	9,951	9,985	10,019	10,053	10,087	9,966	10,011	11,031	10,348	9,904	9,904	10,126	9,546	10,145	10,078
1885	8,965	9,825	10,106	9,891	9,742	9,527	9,673	9,924	9,855	9,787	10,148	11,113	12,319	10,525	10,103
1886	11,868	11,931	12,817	*14,257	*15,016	*15,159	*13,521	*15,265	14,845	14,910	*15,394	*15,685	*16,041	*15,357	*14,447
1887	15,918	*16,541	*16,826	*17,090	14,633	11,979	*15,489	13,320	15,685	*17,706	*18,346	18,329	17,678	*16,831	*16,167
1888	16,352	14,622	14,422	15,099	15,586	15,239	15,227	14,972	15,869	16,648	17,624	*18,866	*19,871	*17,303	*16,265
1889	19,384	19,124	19,147	18,802	17,980	17,774	*18,699	18,115	18,254	18,809	*20,203	*21,404	*22,053	*19,803	*19,256
1890	*22,888	*23,320	*23,687	*23,759	*23,816	23,380	*23,476	22,979	22,664	23,521	*23,942	*24,321	23,642	*23,507	*23,492
1891	19,747	17,590	15,512	14,301	16,518	20,226	17,312	23,571	23,465	24,194	*25,456	*26,139	*26,206	*24,834	21,104
1892	25,303	25,679	25,551	24,521	23,622	23,006	24,611	22,263	21,012	21,161	22,583	23,886	24,102	22,501	*23,550
1893	23,482	23,758	24,323	24,654	24,357	22,444	23,841	18,179	13,146	10,720	10,518	12,428	13,901	13,166	18,459
1894	14,356	15,203	17,246	17,229	12,450	10,639	14,515	14,221	18,826	21,339	22,284	23,604	24,011	20,695	17,630
1895	22,766	22,024	21,680	21,619	21,556	22,625	22,044	25,035	*26,662	*28,151	*29,788	*30,862	30,143	*28,429	*25,263
1896	28,156	26,861	26,133	26,170	25,784	25,028	26,358	23,255	19,620	16,378	16,079	18,339	20,858	19,107	22,713
1897	22,629	23,375	24,108	24,270	24,063	23,655	23,685	23,210	24,634	27,089	29,071	*30,904	*31,815	27,774	*25,746
1898	31,427	*31,978	*32,262	32,152	31,530	30,334	*31,612	29,817	29,533	30,228	31,406	*32,829	*33,881	31,279	*31,444
1899	33,325	32,360	32,948	*34,464	*35,039	*35,899	*34,020	*37,065	*37,374	*38,156	*39,566	*40,782	*41,162	*39,012	*36,539
1900	*41,441	41,360	40,759	40,856	41,368	40,504	*41,047	36,507	32,839	31,322	30,167	30,678	33,239	32,474	*36,725
1901	37,498	40,487	41,274	*41,896	*43,206	*43,916	*41,377	43,859	43,090	43,329	*44,587	*45,398	40,845	*43,509	*42,452
1902	*46,054	44,915	*46,613	*49,182	*49,769	48,225	*47,488	46,512	47,360	47,287	47,772	47,763	49,589	*47,716	*47,603
1903	47,509	49,665	*51,305	*53,614	*55,278	*55,774	*52,205	49,877	50,681	51,791	45,989	34,654	27,313	43,386	*47,759
1904	29,795	41,668	46,820	52,039	49,580	43,191	43,831	36,155	37,830	45,261	46,944	49,554	52,129	44,616	44,226
1905	*57,479	57,048	*62,460	*64,068	63,346	59,773	*60,739	56,191	59,473	63,317	*66,231	*67,121	65,991	*63,039	*61,896
1906	66,739	*68,061	*69,859	69,107	67,701	65,891	*67,885	64,948	62,153	65,699	*70,865	*72,922	72,107	*68,103	*67,995
1907	71,149	*73,039	71,821	*73,975	*74,049	*74,486	*73,074	72,763	72,594	72,783	*75,386	60,939	39,815	65,701	*69,357
1908	33,718	37,163	39,619	38,320	37,603	36,404	37,139	39,294	43,865	47,300	50,555	52,595	56,158	48,277	42,739
1909	57,986	60,976	59,232	57,963	60,753	64,362	60,189	67,853	72,546	*79,507	*83,856	*84,917	*85,022	*78,915	*69,629
1910	84,149	*85,616	84,450	82,792	77,103	75,516	*81,565	69,305	67,963	68,539	67,520	63,659	57,349	65,719	*73,577
1911	56,752	64,090	70,039	68,839	61,079	59,586	63,376	57,839	62,150	65,903	67,811	66,648	65,912	64,357	63,870
1912	66,384	72,442	77,591	79,181	81,051	81,358	76,334	77,771	81,046	82,128	*86,772	*87,695	*89,766	*84,188	*80,283
1913	*90,172	*92,369	89,147	91,759	91,039	87,619	*90,325	82,601	82,121	83,531	82,139	74,453	63,987	78,129	*84,177
1914	60,808	67,453	75,739	75,665	67,506	63,926	68,519	63,150	64,363	62,753	57,361	50,611	48,896	57,868	63,150
1915	51,659	59,813	66,575	70,550	73,015	79,361	66,855	82,691	89,666	*95,085	*100,822	*101,244	*103,333	95,444	81,267
1916	102,746	*106,456	*107,667	107,592	*108,422	107,053	*106,651	104,017	103,346	106,746	*113,189	110,394	102,505	*106,684	*106,668
1917	101,643	94,473	104,882	111,165	110,239	109,002	105,359	107,820	104,772	104,465	106,550	106,859	92,997	103,892	104,619
1918	77,799	82,839	103,648	109,607	111,175	110,793	99,462	110,354	109,339	*113,942	112,482	111,802	110,762	*111,432	105,496
1919	106,525	105,006	99,685	82,607	68,002	70,495	88,584	78,339	88,496	82,932	60,115	79,745	84,944	79,071	83,788
1920	97,264	102,720	108,900	91,327	96,312	101,451	99,665	98,931	101,529	104,310	106,212	97,830	87,222	99,321	99,492
1921	77,945	69,187	51,468	39,768	39,394	35,491	52,089	27,889	30,780	32,850	40,215	47,183	53,196	38,671	45,325
1922	53,063	58,214	65,675	69,070	74,409	78,701	66,578	77,592	58,586	67,791	85,092	94,990	99,577	80,596	73,645
1923	104,181	106,939	113,673	*118,324	*124,764	122,548	*115,147	118,656	111,274	104,184	101,586	96,476	94,225	104,444	*109,713
1924	97,384	106,026	111,809	107,781	84,358	67,539	95,794	57,577	60,875	68,439	79,907	83,656	95,539	74,314	84,995
1925	108,720	114,791	114,975	108,632	94,542	89,115	105,039	85,936	87,241	90,873	97,528	100,767	104,853	94,519	99,831
1926	106,974	104,408	111,032	115,004	112,304	107,844	109,660	103,978	103,241	104,543	107,553	107,890	99,712	104,467	107,043
1927	100,123	105,024	112,366	114,074	109,385	102,988	107,351	95,199	95,073	92,498	89,810	88,279	86,960	91,313	99,266
1928	92,573	100,004	103,215	106,183	105,931	102,733	101,763	99,091	101,180	102,077	108,832	110,084	108,705	104,983	103,382
1929	111,044	114,507	119,822	122,087	*125,745	123,908	*119,562	122,100	121,151	116,585	115,745	106,047	91,513	112,307	*115,851
1930	91,209	101,390	104,715	106,062	104,283	97,804	100,891	85,146	81,417	75,890	69,831	62,237	.....	†73,150	†86,300

*High records for periods specified.
†With December estimated.

Fabricated Structural Steel Orders in the United States

(From United States Department of Commerce)

(Computed Net Tons)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1909.....	70,200	70,200	187,200	261,000	280,800	160,200	1,029,600	192,600	205,200	109,800	97,200	127,800	131,400	864,000	1,893,600
1910.....	159,360	128,640	167,040	153,600	192,000	205,440	1,006,080	101,760	115,200	78,720	76,800	63,360	90,240	526,080	1,532,160
1911.....	114,800	94,300	135,300	114,800	129,150	159,900	748,250	141,450	166,050	153,750	106,600	180,400	178,350	926,600	1,674,850
1912.....	154,070	169,260	147,560	128,030	219,170	160,580	978,670	154,070	175,770	141,050	199,640	138,880	145,390	954,800	1,933,470
1913.....	130,500	162,000	110,250	90,000	119,250	96,750	708,750	130,500	96,750	65,250	78,750	60,750	60,750	492,750	1,201,500
1914.....	140,740	143,010	172,520	199,760	129,390	127,120	912,540	154,360	63,560	86,260	79,450	45,400	79,450	508,480	1,421,020
1915.....	57,750	69,300	147,840	143,220	140,910	184,800	743,820	198,660	196,350	154,770	180,180	242,550	279,510	1,252,020	1,995,840
1916.....	164,220	178,500	242,760	173,740	190,400	138,040	1,087,660	114,240	152,320	126,140	183,260	185,640	204,680	966,280	2,053,940
1917.....	147,620	142,780	164,560	147,620	135,520	113,740	851,840	101,640	91,960	70,180	147,620	186,340	275,880	873,620	1,725,460
1918.....	136,740	144,480	121,260	165,120	154,800	144,480	866,880	299,280	147,060	154,800	110,940	69,660	74,820	856,560	1,723,440
1919.....	31,920	34,580	47,880	66,500	130,340	172,900	484,120	196,840	207,480	207,480	207,480	183,540	226,100	1,228,920	1,713,040
1920.....	207,000	262,200	231,840	187,680	171,120	138,000	1,197,840	138,000	110,400	118,680	71,760	74,520	71,760	585,120	1,782,960
1921.....	50,940	39,620	82,070	87,730	79,240	104,710	444,310	96,220	93,390	135,840	152,820	155,650	113,200	747,120	1,191,430
1922.....	121,600	133,760	234,080	258,400	240,160	221,920	1,209,920	296,720	206,720	194,560	176,320	152,000	185,440	1,121,760	2,331,680
1923.....	227,760	243,360	290,160	243,360	180,960	165,360	1,350,960	162,240	184,080	165,360	159,120	171,600	249,600	1,092,000	2,442,960
1924.....	224,940	228,200	221,680	208,640	192,340	208,640	1,284,440	224,940	192,340	211,900	211,900	267,320	247,760	1,356,160	2,640,600
1925.....	187,380	194,320	225,550	256,780	229,020	284,540	1,377,590	274,130	267,190	270,660	298,420	239,430	253,310	1,603,140	2,980,730
1926.....	208,800	208,800	234,000	252,000	266,400	262,800	1,432,800	248,400	284,400	216,000	230,400	223,200	259,200	1,461,600	2,894,400
1927.....	195,000	243,750	232,500	262,500	232,500	225,000	1,391,250	341,250	270,000	262,500	288,750	236,250	262,500	1,661,250	3,052,500
1928.....	211,750	265,650	257,950	234,850	308,000	300,000	1,578,200	296,450	354,200	319,550	250,250	242,550	246,400	1,709,400	3,287,600
1929.....	273,350	265,650	358,050	334,950	342,650	346,500	1,921,150	350,350	361,900	319,550	342,650	227,150	319,550	1,921,150	3,842,300
1930.....	252,000	284,000	284,000	236,000	296,000	272,000	1,588,000	284,000	264,000	162,000	215,600	.....	.....	.....	.....

Bookings of Fabricated Steel Plate in the United States

(From United States Census Bureau)

(Net Tons)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1923.....	62,892	59,398	72,509	58,158	37,885	60,073	350,915	59,113	37,639	40,525	36,249	30,152	27,280	230,958	581,873
1924.....	23,116	18,768	24,309	22,198	28,107	32,867	149,365	24,576	35,509	22,908	27,581	36,547	51,846	198,967	348,332
1925*....	29,752	23,917	26,577	27,439	32,466	38,288	178,439	34,122	39,824	30,630	34,502	32,606	35,394	207,085	385,524
1926*....	29,627	39,680	42,847	39,385	52,751	44,730	249,020	37,158	51,045	38,739	44,974	63,119	29,858	264,893	513,913
1927.....	35,854	59,643	55,407	47,347	37,883	28,811	264,945	35,434	48,577	38,662	47,090	27,341	35,658	232,762	497,707
1928.....	35,787	49,820	46,839	50,348	42,487	35,202	260,483	35,959	47,245	40,281	53,983	54,420	40,439	272,327	532,810
1929.....	32,705	58,684	57,869	40,675	47,763	45,918	283,614	48,968	39,702	41,653	32,099	42,295	23,539	228,256	510,870
1930.....	50,076	28,332	38,051	39,473	30,306	35,367	221,605	31,439	29,235	33,602	24,002	.....	.....	†170,000	†392,000

*During these years additional plants were added to those reporting monthly tonnages.
†With November and December estimated.

Steel Sheets Produced in the United States

(National Association of Sheet and Tin Plate Manufacturers)

(Black, Blue Annealed, Galvanized and Full-Finished, Net Tons)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1919.....	132,796	127,168	110,329	112,720	108,739	119,363	711,125	115,324	129,861	102,035	79,872	128,617	142,405	699,114	1,410,239
1920.....	185,271	177,410	198,606	165,811	161,645	166,819	1,055,562	142,023	188,458	198,467	202,703	185,450	85,204	1,002,305	2,057,867
1921.....	37,011	45,520	74,239	85,592	106,969	83,374	432,705	49,096	94,900	106,454	131,577	127,983	82,198	592,208	1,024,913
1922.....	86,130	122,439	166,244	184,979	218,739	210,464	988,995	179,100	228,398	202,600	243,476	242,562	265,239	1,301,375	2,290,370
1923.....	260,520	237,919	279,475	251,808	260,006	218,432	1,508,160	174,910	234,112	185,577	225,714	188,144	155,299	1,163,756	2,671,916
1924.....	274,097	275,118	278,767	234,000	176,582	114,807	1,353,371	144,291	190,439	217,978	247,222	224,931	259,794	1,284,655	2,638,026
1925.....	317,424	283,290	290,308	280,082	260,470	266,290	1,697,864	246,404	270,212	295,810	348,714	336,021	326,960	1,824,121	3,521,985
1926.....	328,639	299,557	319,132	294,811	264,539	268,450	1,775,128	239,764	293,703	307,459	314,598	278,455	238,345	1,672,324	3,447,452
1927.....	256,856	282,172	359,339	316,100	309,360	300,706	1,824,533	237,239	266,649	220,919	245,767	230,039	260,130	1,460,743	3,285,276
1928.....	316,539	330,567	366,127	327,909	349,368	311,629	2,002,139	267,684	329,396	318,907	369,239	358,406	302,182	1,945,814	3,947,953
1929.....	391,404	326,468	364,202	375,256	393,432	337,839	2,188,601	323,905	366,734	302,490	319,660	204,071	181,916	1,698,776	3,887,377
1930.....	291,529	275,952	259,658	308,988	274,220	205,675	1,616,022	186,206	173,956	179,928	193,934	.....	.....	*1,100,000	*2,716,000

*With November and December estimated.

Shipments of Steel Barrels in the United States

(From United States Department of Commerce)

(Number)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1921.....	126,903	125,789	140,382	191,155	137,862	137,766	853,857	148,852	239,263	180,172	255,229	200,306	190,778	1,214,600	2,068,457
1922.....	178,432	203,060	336,952	400,428	450,744	533,888	2,103,504	441,984	488,542	412,896	378,966	388,139	402,639	2,513,166	4,616,670
1923.....	457,824	431,093	565,718	544,722	520,978	461,250	2,981,585	468,048	482,504	365,580	393,496	343,472	321,439	2,374,539	5,356,124
1924.....	303,668	362,725	394,756	420,129	425,397	382,550	2,289,225	407,258	398,312	389,064	441,851	389,239	407,474	2,433,189	4,722,414
1925.....	415,039	407,782	510,928	605,424	569,670	508,880	3,017,723	506,891	495,739	503,221	555,981	498,070	474,742	3,034,644	6,052,367
1926.....	469,432	518,104	622,312	608,056	582,352	624,083	3,424,339	593,610	511,542	508,548	497,031	505,383	546,392	3,162,506	6,586,845
1927.....	525,518	503,183	568,821	609,090	575,712	605,123	3,387,447	576,602	610,454	525,374	572,893	497,344	454,639	3,237,306	6,624,753
1928.....	474,159	514,362	644,521	661,949	694,843	717,496	3,707,330	645,881	675,600	595,639	661,010	568,353	549,913	3,696,396	7,403,726
1929.....	548,581	563,532	743,407	775,481	834,699	779,567	4,245,267	782,411	809,860	653,890	638,681	567,257	618,003	4,070,102	8,315,369
1930.....	643,120	643,324	856,451	766,617	736,147	638,358	4,284,017	621,091	552,265	565,204	619,558	.....	.....	.....	.....

Malleable Castings Produced in the United States

(From United States Department of Commerce)

(Net Tons)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1923.....	.....	.....	.....	.....	.....	72,413	.....	62,275	72,115	64,110	65,008	53,892	50,982	368,382	.....
1924.....	64,339	66,436	69,574	56,897	48,552	33,323	339,121	30,070	34,350	39,261	47,305	45,279	55,028	251,293	590,414
1925.....	62,829	56,399	57,304	59,046	57,289	55,143	348,010	53,450	53,221	54,943	64,216	58,315	61,791	345,936	693,946
1926.....	72,417	62,574	70,474	62,812	55,803	56,659	380,739	51,568	53,796	54,630	53,963	43,214	46,977	304,148	684,887
1927*....	56,627	62,335	72,205	64,612	62,747	64,310	382,836	53,046	57,096	50,807	52,458	46,698	53,824	313,929	696,765
1928.....	61,072	65,359	70,070	63,380	67,903	67,090	394,874	60,290	68,606	62,665	70,054	63,560	59,428	384,603	779,477
1929.....	73,125	73,875	83,365	83,765	81,704	72,282	468,116	70,625	68,651	59,589	65,305	46,448	45,083	355,701	823,817
1930.....	61,381	65,939	63,464	61,898	62,039	39,339	354,060	30,742	25,409	26,505	28,641	.....	.....	.....	.....

*A larger number of firms reported monthly production for 1927 and later years.
Figures prior to June, 1923, not available.

Automobiles Produced in the United States

(Cars and Trucks)

(From United States Department of Commerce)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1922	91,292	122,531	172,998	219,889	256,582	289,407	1,152,699	247,186	274,209	207,206	239,406	237,329	228,410	1,433,746	2,586,445
1923	244,302	277,601	358,779	377,939	393,823	378,558	2,031,002	330,039	346,843	327,892	365,451	313,597	305,431	1,989,253	4,020,255
1924	318,526	370,319	382,718	375,858	314,105	251,775	2,013,301	270,312	284,649	296,333	294,643	234,615	207,065	1,587,617	3,600,918
1925	240,578	283,639	374,406	433,792	419,056	398,524	2,149,995	398,947	260,236	325,728	441,981	372,271	316,672	2,115,835	4,265,830
1926	308,998	363,652	433,467	439,336	425,167	386,269	2,356,889	359,610	426,851	398,939	334,420	256,301	167,924	1,944,045	4,300,934
1927	238,904	304,739	394,513	406,382	405,648	323,817	2,074,003	269,396	309,994	260,310	219,682	134,370	133,571	1,327,323	3,401,326
1928	231,728	323,796	413,314	410,104	425,783	396,795	2,201,520	392,087	461,298	415,314	397,284	257,139	234,117	2,157,239	4,358,759
1929	401,039	466,416	585,455	621,910	604,691	545,932	3,225,443	500,840	498,628	415,912	380,017	217,573	120,007	2,132,977	5,358,420
1930	275,374	346,939	401,313	443,039	417,406	335,477	2,219,548	262,364	223,048	222,931	150,044	.....	.....	*1,150,000	*3,370,000

In no year prior to 1922 did total United States production reach 2,200,000 units.
*With November and December estimated.

Railroad Freight Cars Ordered in the United States

(From Railway Age)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1915	3,300	4,255	1,188	1,000	41,110	11,964	62,817	7,935	16,300	5,062	30,508	15,700	10,834	86,339	149,156
1916	25,613	10,523	16,308	8,228	7,204	5,571	73,447	2,823	3,644	9,128	21,031	40,839	18,335	95,800	169,247
1917	9,106	14,131	17,282	3,623	3,828	21,465	69,435	6,770	465	605	46,700	10,839	2,433	67,812	137,247
1918	480	5,599	8,500	1,244	95,745	4,500	116,068	10,000	0	0	51,995	80	4,050	66,125	182,193
1919	0	1,100	5	166	778	1,161	3,210	1,020	3,946	2,504	8,936	1,631	1,557	19,594	22,804
1920	3,226	6,908	4,294	19,670	7,609	4,132	45,833	5,534	7,056	3,194	6,055	2,350	50	24,239	70,072
1921	0	2,945	0	1,320	10	800	5,075	25	0	400	3,720	7,715	1,590	13,450	18,525
1922	8,210	14,771	5,575	30,677	18,439	11,095	88,767	15,825	776	6,779	14,521	6,589	28,490	72,980	161,747
1923	11,170	10,266	34,514	9,744	150	1,755	67,599	1,047	1,310	1,920	739	1,110	15,004	21,130	88,729
1924	7,300	18,395	35,846	11,189	443	412	73,585	2,187	4,866	22,845	11,866	13,039	9,539	64,342	137,927
1925	10,312	5,477	4,703	5,714	8,974	777	35,957	1,146	2,974	6,163	6,051	13,922	13,839	44,095	80,052
1926	11,631	11,353	8,844	4,490	843	4,270	41,431	1,256	366	2,564	2,975	2,732	5,831	15,724	57,155
1927	17,321	4,185	5,253	3,414	4,553	7,609	42,335	1,439	1,208	357	9	903	13,339	17,255	59,590
1928	3,298	7,068	1,997	5,683	2,523	2,263	22,832	3,657	822	1,350	1,639	6,200	4,739	18,407	41,239
1929	12,477	14,513	12,508	7,083	8,364	5,869	60,814	442	2,585	4,257	17,347	5,939	9,785	40,355	101,169
1930	6,848	15,986	4,467	1,543	1,079	819	30,742	1,306	1,248	680	3,291	2,862	.....	*11,400	*42,100

*With December estimated.

Production of Steel Trackwork in the United States

(For tee-rail track of 60 lb. and over)

(From American Iron and Steel Institute, in Net Tons)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1925	11,096	14,292	17,565	16,792	17,075	17,416	94,736	13,858	12,982	11,373	12,689	12,281	13,475	76,658	171,394
1926	15,247	16,158	19,756	19,547	19,196	18,762	108,666	15,635	15,203	15,159	15,568	12,225	14,549	87,339	196,005
1927	12,969	13,678	19,216	17,081	16,768	14,557	94,269	13,217	13,387	10,999	9,914	9,706	9,139	66,362	160,631
1928	9,332	11,371	15,058	13,511	14,139	13,718	77,129	11,776	11,039	10,768	9,493	8,379	11,061	62,516	139,645
1929	10,344	12,180	14,927	16,815	16,332	14,839	85,437	13,844	14,818	12,962	12,902	11,326	10,826	76,678	162,115
1930	11,830	12,524	13,096	13,508	12,779	10,553	74,290	8,774	6,812	5,642	5,192	4,212	.....	*35,700	*110,000

*With December estimated.

Locomotives Ordered in the United States

(From Railway Age)

	January	February	March	April	May	June	Half Year	July	August	September	October	November	December	Second Half	Year
1915	39	152	114	20	116	564	1,005	24	158	176	299	216	126	999	2,004
1916	232	401	1,095	190	278	287	2,584	51	185	262	268	930	996	2,692	5,276
1917	425	721	272	324	784	684	3,210	218	18	270	927	206	0	1,639	4,849
1918	194	91	0	106	1,053	390	1,834	515	0	15	750	0	19	1,299	3,133
1919	0	129	0	28	218	46	421	23	186	22	86	8	0	746	1,167
1920	239	379	317	539	206	105	1,785	172	39	181	172	86	94	744	2,529
1921	10	4	68	153	68	23	326	75	69	35	119	60	55	413	739
1922	5	8	77	298	136	37	561	362	249	619	186	248	202	1,866	2,427
1923	374	486	539	152	94	152	1,797	11	10	18	51	49	23	162	1,959
1924	131	93	284	104	163	4	779	96	15	115	139	93	173	631	1,410
1925	52	49	107	96	79	42	425	61	41	97	236	118	239	792	1,217
1926	64	14	421	74	73	193	839	22	86	34	80	226	52	500	1,339
1927	26	85	85	29	185	73	483	1	28	11	14	22	144	220	703
1928	14	29	15	35	66	11	170	39	86	9	4	39	62	239	409
1929	32	82	152	69	50	181	566	36	46	87	139	77	168	553	1,119
1930	167	16	44	29	22	1	279	2	35	25	7	4	...	*75	*354

*With December estimated.

Unfilled Orders, United States Steel Corporation

(End of month, in thousands of gross tons)

	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
January	(a)	3,111	5,380	7,827	4,614	4,249	7,923	11,474	9,478	6,684	9,285	7,573	4,242	6,911	4,798	5,037	4,883	3,800	4,398	4,144	4,480
February	(a)	3,401	5,454	7,657	5,026	4,345	8,569	11,577	9,288	6,011	9,502	6,934	4,141	7,284	4,913	5,285	4,617	3,597	4,276	4,109	4,469
March	5,493	3,447	5,305	7,469	4,654	4,256	9,331	11,712	9,056	5,431	9,892	6,285	4,494	7,403	4,783	4,864	4,380	3,553	3,977	4,417	4,570
April	(a)	3,219	5,665	6,979	4,277	4,162	9,830	12,183	8,742	4,801	10,360	5,845	5,097	7,289	4,208	4,447	3,868	3,456	3,673	4,125	4,354
May	(a)	3,113	5,751	6,324	3,998	4,265	9,939	11,887	8,339	4,282	10,940	5,482	5,254	6,981	3,628	4,050	3,649	3,051	3,751	4,087	4,059
June	4,258	3,361	5,807	5,807	4,033	4,678	9,639	11,383	8,918	4,893	10,979	5,118	5,636	6,386	3,263	3,710	3,479	3,053	3,698	3,903	3,968
July	3,971	3,696	5,957	5,399	4,159	4,929	9,594	10,844	8,884	5,579	11,118	4,830	5,776	5,911	3,187	3,539	3,603	3,142	3,624	3,658	4,022
August	3,537	3,584	6,163	5,223	4,213	4,908	9,660	10,407	8,759	6,109	10,805	4,532	5,950	5,415	3,290	3,513	3,542	3,196	3,571	4,088	3,580
September	3,158	3,611	6,552	5,004	3,788	5,318	9,523	9,833	8,298	6,285	10,375	4,561	6,692	5,036	3,474	3,717	3,594	3,148	3,637	4,257	3,424
October	2,872	3,694	7,594	4,514	3,461	6,165	10,015	9,010	8,353	6,473	9,837	4,287	6,902	4,673	3,525	4,109	3,684	3,341	3,417	4,304	3,482
November	2,760	4,142	7,853	4,396	3,325	7,189	11,059	8,897	8,125	7,128	9,021	4,251	6,840	4,369	4,032	4,582	3,807	3,454	3,872	4,428	3,639
December	2,675	5,085	7,932	4,282	3,837	7,806	11,547	9,382	7,379	8,265	8,148	4,268	6,746	4,445	4,817	5,033	3,961	3,973	4,335	4,411	....
Average	....	*3,622*	*6,284*	*5,907*	*4,115*	*5,189*	*9,719*	*10,716*	*8,635*	*5,995*	*10,022*	*5,331*	*5,648*	*6,009*	*3,993*	*4,324*	*3,922*	*3,397*	*3,852*	*4,161*	*4,004*

(a) Figures were reported quarterly, prior to July, 1910.
Average for 1930 is for 11 months only.



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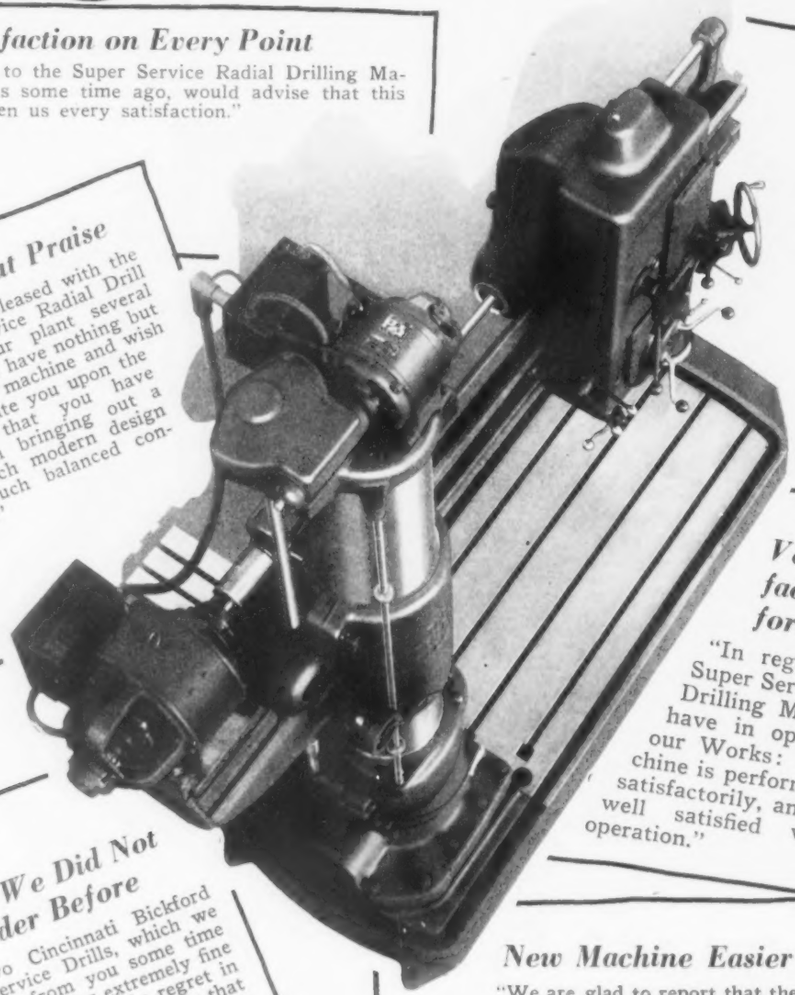
"We are advised by our Superintendent that the performance of this machine up to date is entirely satisfactory. Our Superintendent advises that it is giving exceptionally good service."

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"With reference to the Super Service Radial Drilling Machine supplied us some time ago, would advise that this machine has given us every satisfaction."

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"We are much pleased with the 4-ft. Super Service Radial Drill installed in our plant several weeks ago. We have nothing but praise for the machine and wish to congratulate you upon the success that you have achieved in bringing out a tool of such modern design and of such balanced construction."



Very Satisfactory Performance

"In regard to the Super Service Radial Drilling Machine we have in operation in our Works: This machine is performing very satisfactorily, and we are well satisfied with its operation."

Sorry We Did Not Order Before

"The two Cincinnati Bickford Super Service Drills, which we purchased from you some time ago, are giving us extremely fine satisfaction. Our only regret in regard to this equipment is that we did not purchase same before we did, because the production results that we are obtaining are equal to and in many cases exceeding what we estimated would happen."

New Machine Easier to Operate

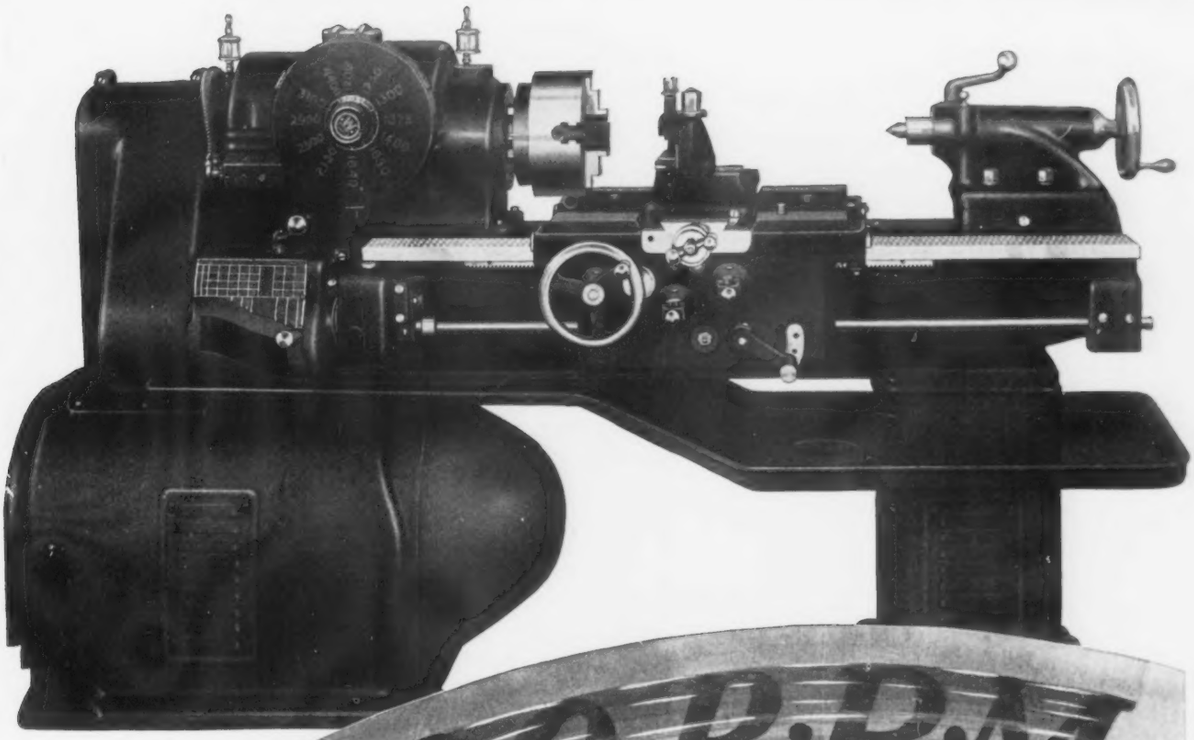
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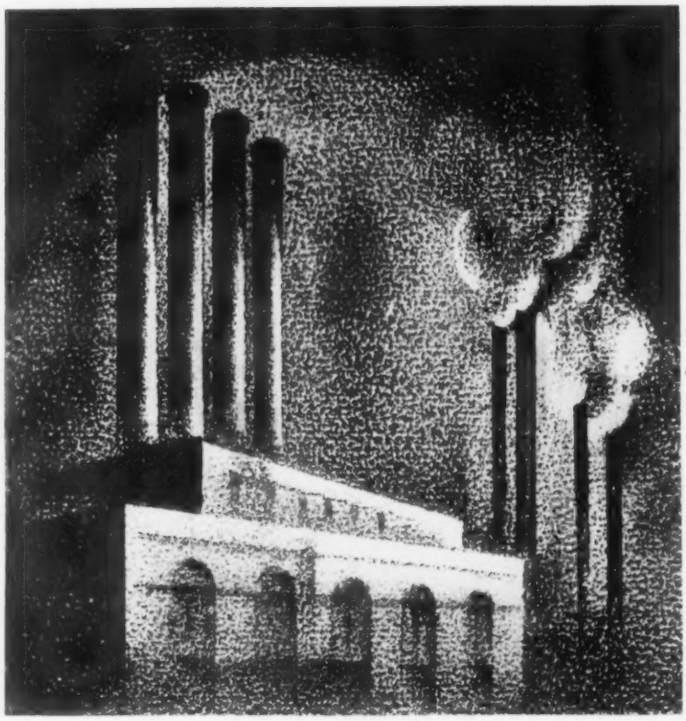
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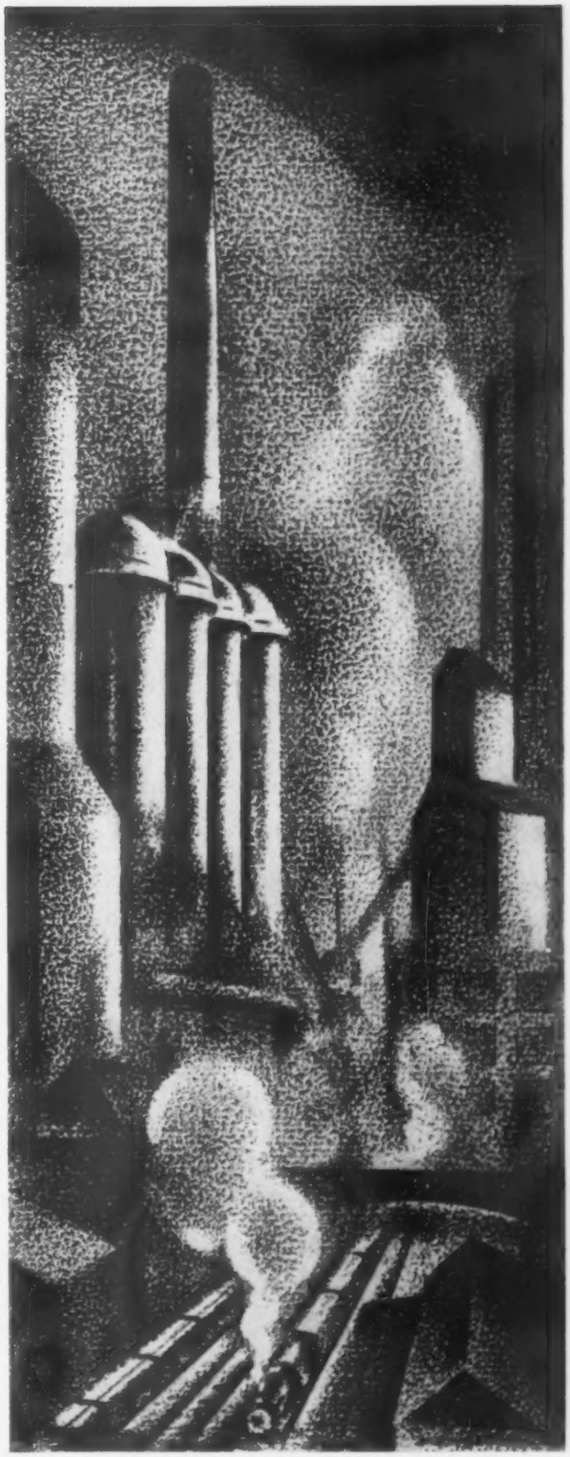
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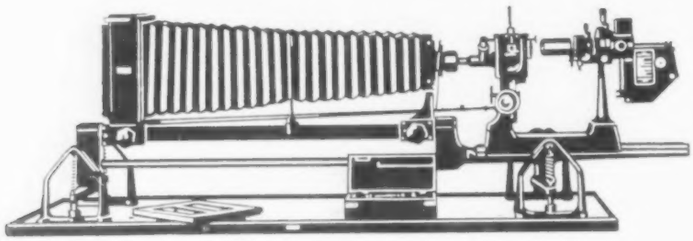
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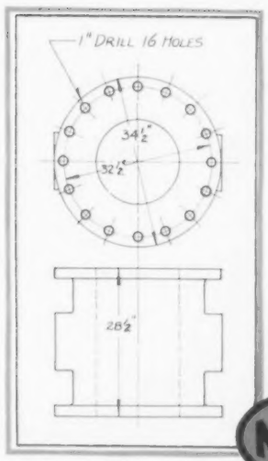
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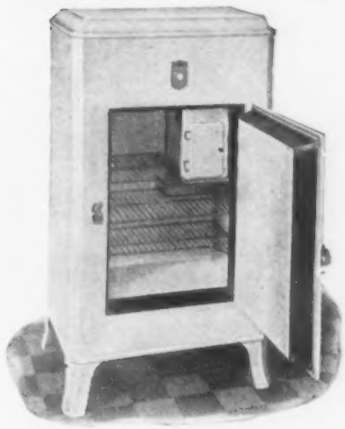
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There's a New

MAJESTIC ELECTRIC REFRIGERATOR

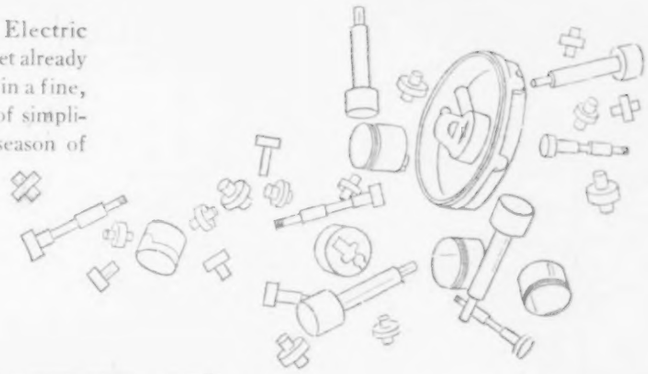
in the Field . . . and

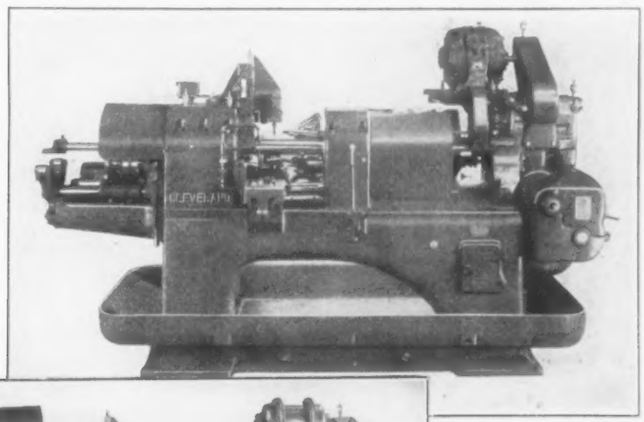
CLEVELAND AUTOMATIC

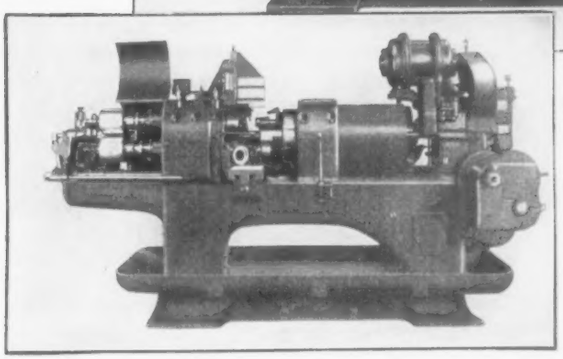
Shares in Its Triumph

THIS NEWEST IMPROVED Electric Refrigerator finds ready favor in a market already won by the proved excellence of Majestic Radios. Built in a fine, newly equipped plant and embodying new principles of simplified construction, its launching in the Christmas season of 1930 has been a notable merchandising event.

Cleveland Automatic is proud to have been entrusted with the task of providing all of the rotary automatic machine equipment for making parts entering into Majestic Refrigerators.







Above—Newest Model M, Cleveland Automatic 4-spindle bar machine.

At left—Newest Model M, Cleveland Automatic, 4-spindle chucking machine for machining castings, forgings, etc.

SUCCESSFUL merchandising commences in the factory . . in being sure that the product is right in every detail and can be produced at a price which is attractive to the public.

Cleveland equipment [both bar and chucking machines] provide the speed, precision, variability and unified, coordinated operation that keeps cost at a minimum and products at a standard of uniform perfection.

Cleveland engineers are always ready to consult on problems of simplified machining and cost reduction.

CLEVELAND AUTOMATICS

THE CLEVELAND AUTOMATIC MACHINE COMPANY

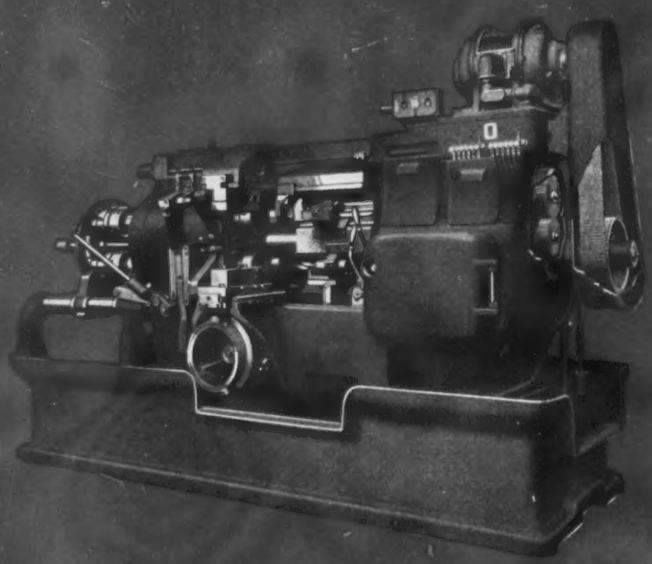
2269 Ashland Road, Cleveland, Ohio, U. S. A.

NEW YORK
95 Liberty Street

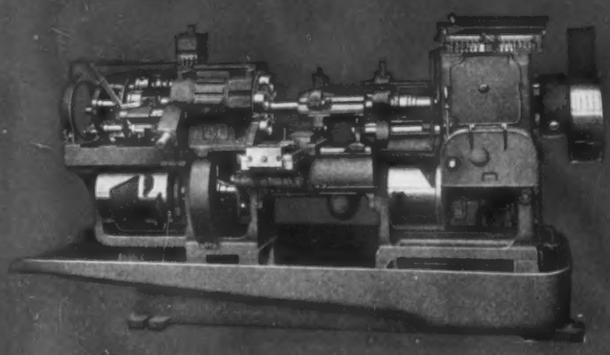
CHICAGO
565 W. Washington Boulevard

DETROIT
1217 Book Building

MORE THAN THIRTY YEARS OF IMPROVEMENT HAVE PRODUCED



Model "GA" Heavy Duty, Gridley Multiple Spindle Automatic Screw Machine



Model "C" Acme Five Spindle Automatic Screw Machine

THE other day we heard the superintendent of a big screw products plant say:

"That new "GA" Gridley Automatic is the sweetest running screw machine I ever saw. The men all fight to work on it. All they have to do is grind the tools, adjust to the size and forget the machine. We're turning out as tough a piece on that machine as you can imagine and it certainly is a beautiful job. No wonder the men like that new "GA" it never gives them any trouble and the production beats the old machine almost two to one."

It's because we hear remarks like the above every day, that we can recommend the new "GA" without reservation for the type of work for which it is adapted. The new style Model "C" is it's running mate for work that requires a five spindle automatic.

Bulletin GA-1 gives full detail

And remember Gridley and Acme Automatics are manufactured only by The National Acme Company of Cleveland, Ohio—at Windsor, Vt.

THE NATIONAL

CONTINUOUS

THESE TOOLS

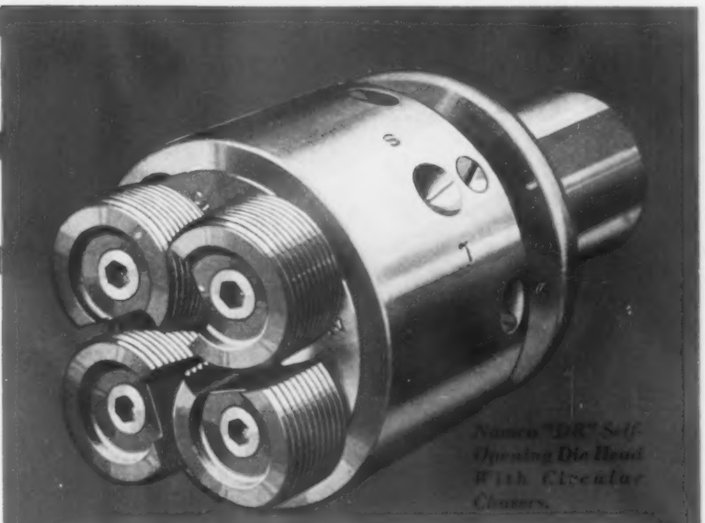
PERFORMANCE figures furnished by leading industrial concerns throughout the country, verify our statement that the new NAMCO "DR" and "DS" Die Heads in use with the new NAMCO Circular Chasers, are the greatest advance in threading tool equipment in the last ten years.

Continuous, unequalled performance and the high quality of threads produced, have placed these new NAMCO tools in an enviable position in their field.

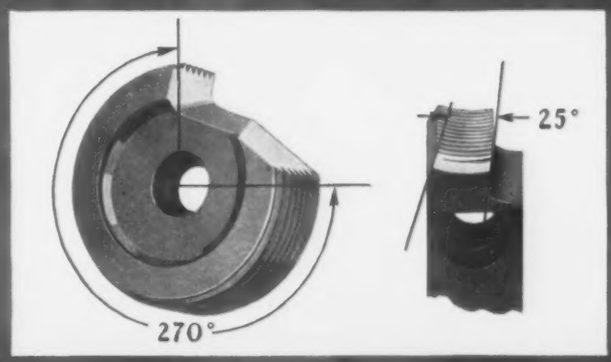
If you have not already received the descriptive literature covering these items just ask for complete information. The facts will really open your eyes.

Bulletin TD-I tells the whole story

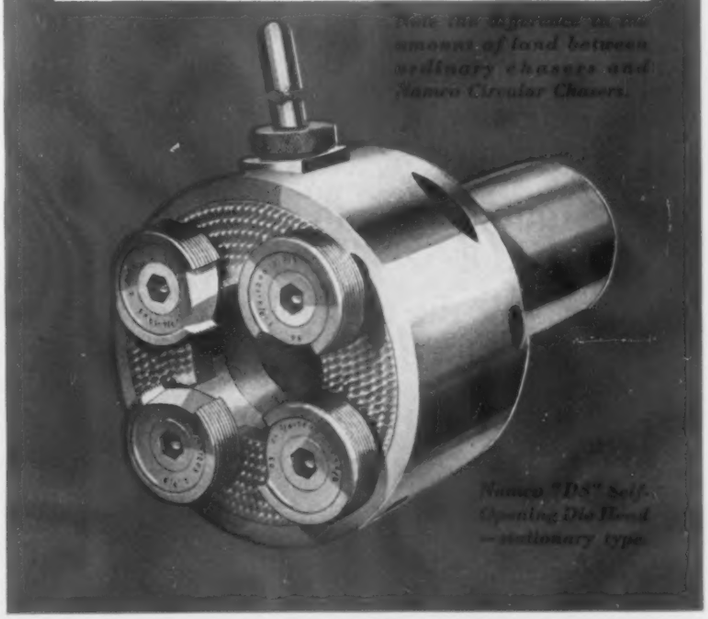




Namco "DR" Self-Opening Die Head With Circular Chasers.



Note the difference in the amount of land between ordinary chasers and Namco Circular Chasers.



Namco "DS" Self-Opening Die Head —stationary type.

ACME COMPANY



It *will* stop raining!

It always has. The farmer who uses his rainy day time to prepare for fair weather will surely gather in his crops quicker and cheaper than his short-sighted brother.

Business *will* get better. It always has. And the Company that prepares for better business will secure most of it, at less cost and more quickly than his negligent competitors.

And we believe, emphatically, that this is the time to throw out of the plant the obsolescent machinery, equipment and methods that would block progress in the busy times that are just around the corner.

We say this—and we are doing it.

Jig Borers
Model B Lathes
Vertical Shapers
Thread Millers
Surface Grinders
Centering Machines
Automatic Machines
Deep Hole Drillers
Bench Machine Tool Equipment
Profilers, Die Sinkers
Vertical Automatics
Small Tools
Gages

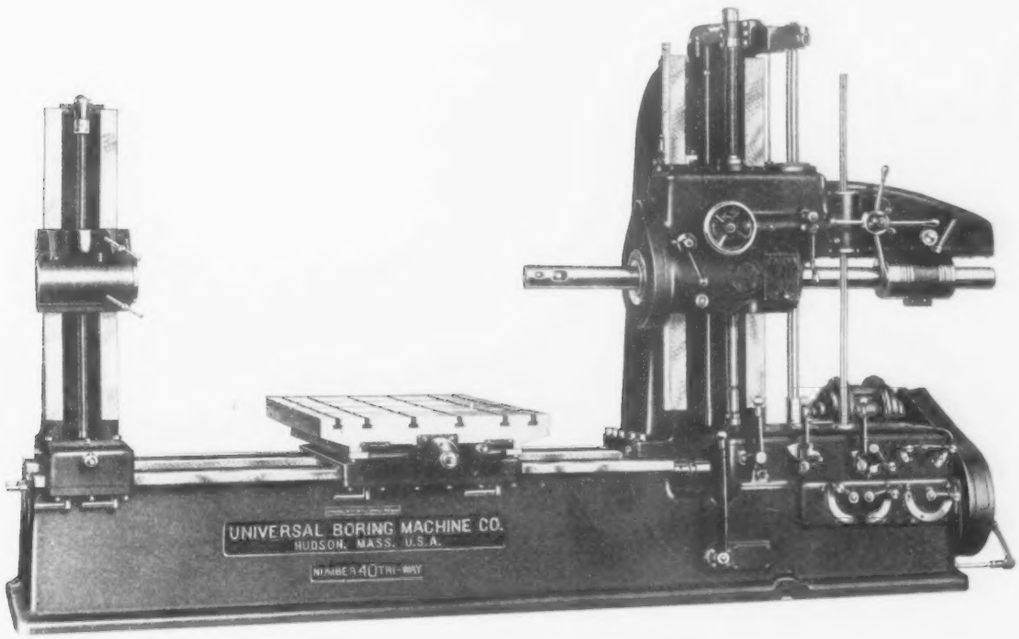
PRATT & WHITNEY CO., *Hartford, Conn.*

Sales Offices and Agencies

BIRMINGHAM	CHICAGO	DETROIT	PHILADELPHIA	SAN FRANCISCO
BOSTON	CINCINNATI	LOS ANGELES	PITTSBURGH	ST. LOUIS
	CLEVELAND	NEW YORK	ROCHESTER	

UNIVERSAL (HORIZONTAL) BORING MACHINE

TRI-WAY TYPE



A "Universal" will earn its cost in two years—or less . . .

If you are planning to add new or replace old equipment, weigh carefully the advantages of a "Universal."

Many different jobs which ordinarily require the use of two or more machine tools to finish, can be handled *completely* on a Universal (Horizontal) Boring Machine—one machine will replace several obsolete pieces of equipment of other types at the lowest possible cash outlay.

Boring, milling and drilling can frequently be done with one set-up, saving time and labor, insuring perfect alignment and absolute accuracy. Taper roller bearings permit the use of high spindle speeds with safety, reducing vibration and eliminating the slight difference between the running and standing positions of spindle which occur when plain bearings are used.

Few heavy machine tools pay for themselves as quickly as a "Universal"—write for complete information.

Universal Boring Machine Co.

HUDSON, MASS., U.S.A.

"WHERE ACCURACY COUNTS, WE WIN"

4568

All Levers Reached From One Position

~ ~ *easier control*

For simplicity and greater operating speed, all levers are placed within easy reach of the operator—saving many extra steps and speeding up production.

There are also many other features on the Cleveland Open Side Planer that meet the approval of the pace-setting shops.

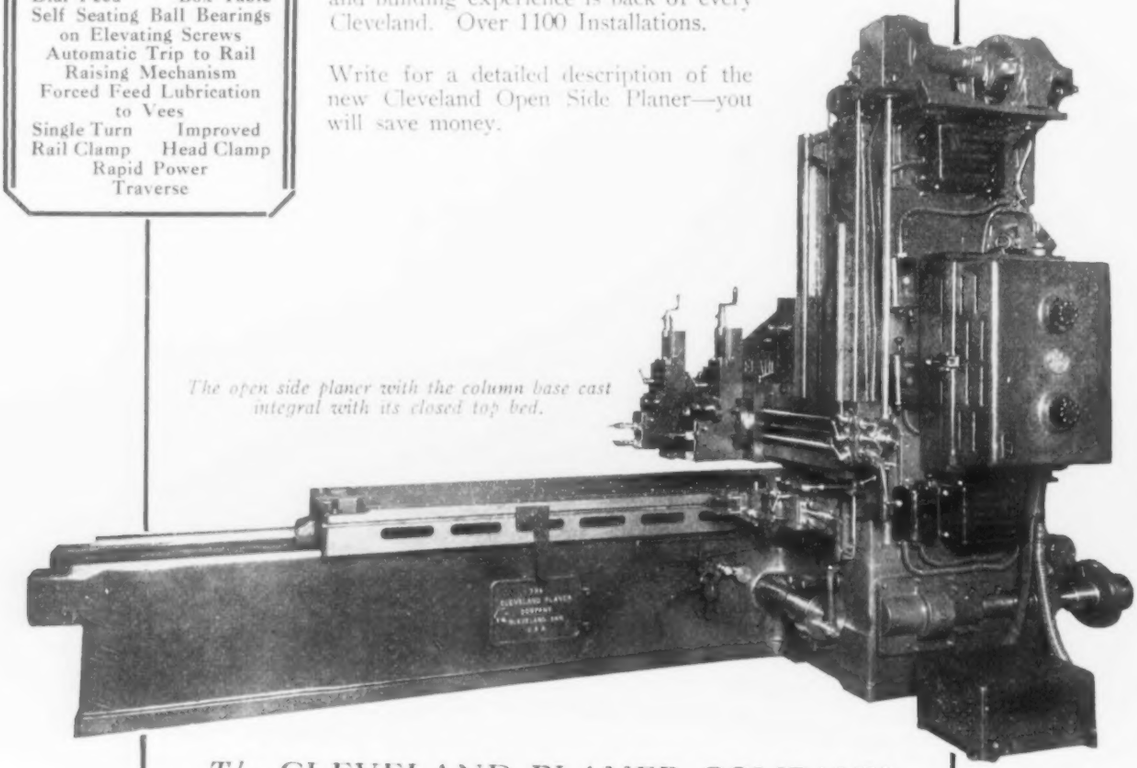
Every improvement made on the new Cleveland has reduced operating costs, and increased the speed, accuracy, and life of the machine. The universal acceptance of Cleveland Open Side Planers by leading manufacturers is a direct result of proved performance.

Thirty years of progressive designing and building experience is back of every Cleveland. Over 1100 Installations.

Write for a detailed description of the new Cleveland Open Side Planer—you will save money.

Check These FEATURES

Dial Feed — Box Table
Self Seating Ball Bearings on Elevating Screws
Automatic Trip to Rail Raising Mechanism
Forced Feed Lubrication to Vees
Single Turn Rail Clamp — Improved Head Clamp
Rapid Power Traverse



The open side planer with the column base cast integral with its closed top bed.

The CLEVELAND PLANER COMPANY

Established 1900

3148 *Superior Ave., Cleveland, Ohio*

Why *do people wear glasses?*

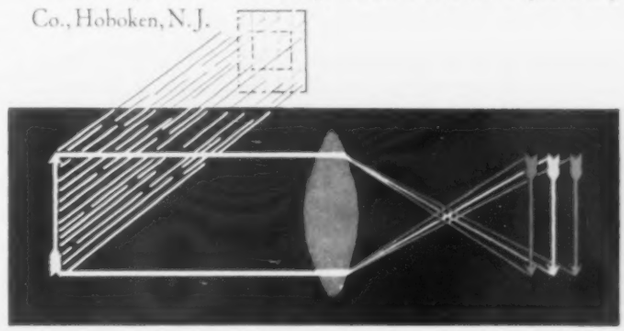


WHY wear glasses? The specific reasons are varied and many, but always the object is to improve impaired vision—to correct the focus of the eyes. Faulty focus, you know, makes objects appear hazy—blurs outlines and strains your eyes.

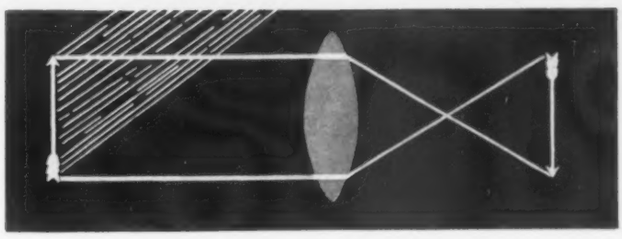
Weak eyes brought back to normal by the use of glasses, and even normal eyes without glasses, do not see objects as clearly as the construction of the eye permits. For there is a *natural* faulty focus of wholly *normal* eyes, which is caused by the complex mixture of colored rays that compose daylight or "white" light.

Your eyes are unable to bring all these colors in white light to the same plane of focus in the eye. Should your eyes focus on a color at one end of the spectrum, say red or orange, the colors at the other end, blue and violet, would be out of focus. So Nature compromises: Your eyes focus on the middle color, yellow-green.

Cooper Hewitt light is composed almost entirely of these yellow-green rays—That's why all objects under Cooper Hewitt light are seen clearly and sharply without eye-strain. Have you read "Why Cooper Hewitt light is better than daylight?" A copy of this booklet is yours for the asking. General Electric Vapor Lamp Co., Hoboken, N. J.



Diagrammatic illustration of the effect produced when white light passes through a lens similar to that in the human eye. The light is split into its various colors, only one of which can be focused sharply. The other colors, being slightly out of focus, tend to make the image hazy.



When Cooper Hewitt light, which is 90% yellow-green, passes through a lens similar to that in the eye, the image produced is sharp and clear, for the effect is practically that of a single color, and that the best-seeing color and the easiest on the eyes.

Join us in the General Electric Hour, broadcast every Saturday evening on a nation-wide N. B. C. network

GENERAL ELECTRIC
VAPOR LAMP COMPANY

(See next page)

where WOULD *you go to thread a needle?*

In an exaggerated circumstance—say, when you thread a needle—you recognize instantly the importance of both the adequacy and the direction of light. And just so does light play its part in your industrial plant.

. — .

Poor lighting annually exacts a tremendous toll from American industry. It is responsible for a high percentage of the "seconds" turned out in every plant. It is the direct cause of innumerable mistakes all along the production line, wasting materials, wasting time, wasting profits.

. — .

Exact figures on the number and value of rejects, seconds and other losses caused directly and indirectly by inadequate and improper lighting are, of course, most difficult to obtain. But this much can be said:

. — .

Only 15 per cent of America's industrial plants are adequately and properly lighted. In these, accidents are comparatively few, seconds run low and production is high.

. — .

Only 29 per cent can be said to be "fairly well lighted." In these, accidents are more common, the percentage of seconds runs higher and production is lower.



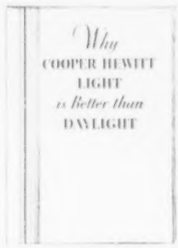
BETTER THAN DAYLIGHT

. — .

The remaining 56 per cent of all industrial plants are classed as poorly lighted. And in these, investigation has shown, the accident rate is high, the percentage of seconds is high and production is lowest.

. — .

Cooper Hewitt mercury-vapor light, as some thirty different industries in America have discovered, is *the* light that "gets the industrial needle threaded." Some reasons why it helps reduce waste to a minimum, improves quality, and increases efficiency and profits generally, are given on the opposite side of this page. Many of the reasons are simply explained in the new illustrated booklet, "Why Cooper Hewitt Light is Better than Daylight." Free for the asking. Address: General Electric Vapor Lamp Co., 833 Adams St., Hoboken, N. J.



JOIN US in the General Electric Hour broadcast every Saturday evening on a nation-wide N. B. C. network

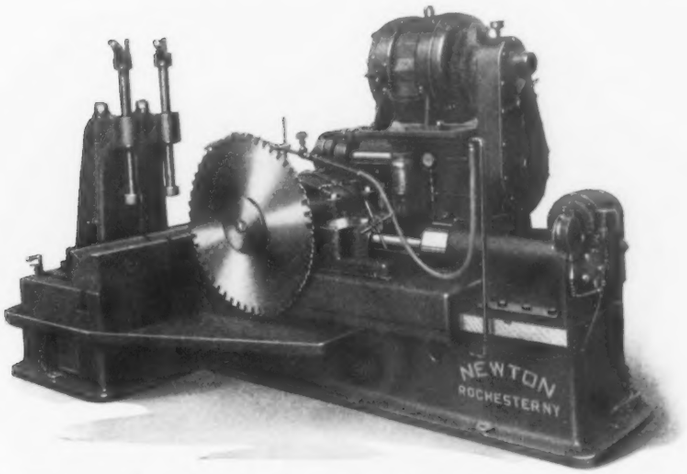
GENERAL ELECTRIC
VAPOR LAMP COMPANY

(See preceding page)

G. E. V. L. Co. 3930

NEWTON

HYDRAULIC FEED COLD SAW



Here Are Six of These Machines We Have Just Delivered to One of the Large Steel Companies for Production Work.

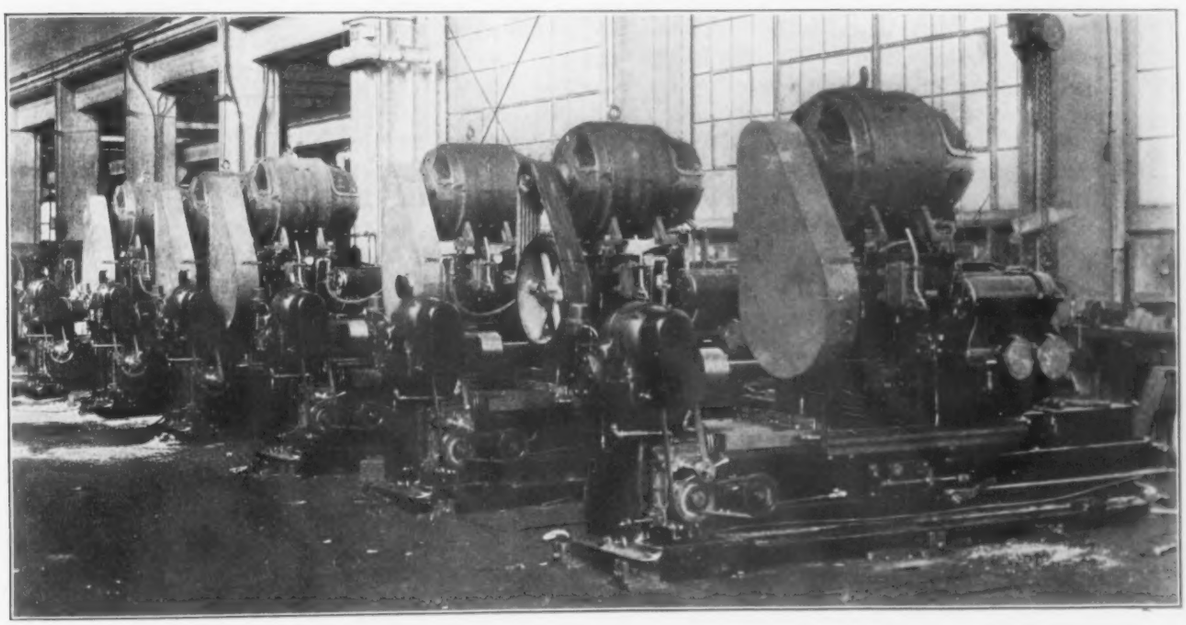
2¾ inches per minute **FEED**

CUTTING S.A.E. 1040 STEEL BILLETS

9½" DIAMETER

This feed rate can be maintained on production work without undue breakage of saw teeth on account of the design of the machine, its absolute rigidity and method of operation.

Write for Bulletin No. 51-E.

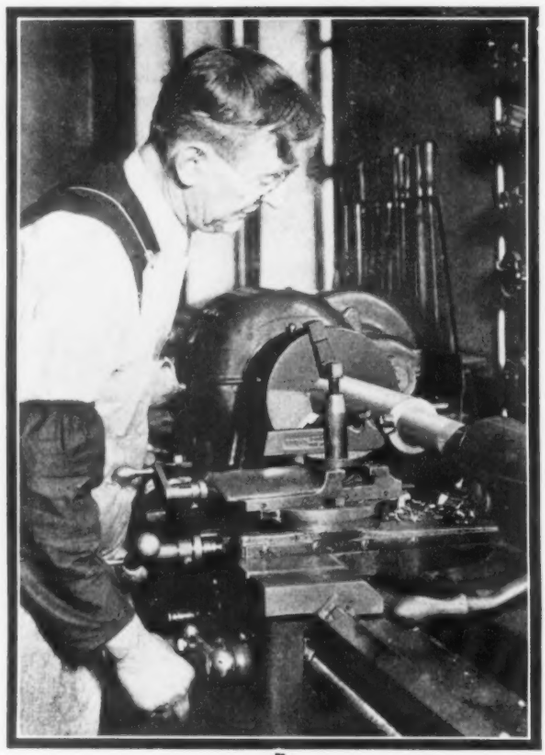


BETTS - NEWTON - COLBURN - HILLES & JONES - MODERN

CONSOLIDATED

CONSOLIDATED MACHINE TOOL CORPORATION *of* AMERICA, Rochester, N. Y.

ARMSTRONG TOOL HOLDERS Are Used In Over 96% of the Machine Shops and Tool Rooms



Testimonials *that can't be bought*

"Other tool holders come and go but ARMSTRONG Tool Holders last forever."—*W. S. Graham, Works Manager, Hupp Motor Car Corporation.* "ARMSTRONG Tool Holders are so much more economical and do our work so satisfactorily that we would not consider the use of forged tools."—*J. W. Carter, Factory Manager, Remington Typewriter Co.* "ARMSTRONG Tool Holders on all our machines, thereby effecting a great saving."—*M. F. Moore, Manager, Kewanee Boiler Co.* "Would hate to run a machine shop without them."—*P. J. Jones, Vice President, Corinth Machinery Co.* "Exclusively on our machine tools."—*W. H. Jordan, Assistant Mechanical Superintendent, N. O. R. R.* "Highly efficient and thoroughly satisfactory."—*J. E. Payne, Assistant Superintendent and Engineer, American Malleables Co.*

Voluntary statements of sound and practical men, based on years of wide experience. With these and similar statements by a score of industrial leaders, ARMSTRONG Tool Holders are advertised. "Testimonial Advertising," it is true, but with *testimonials that can't be bought.*



ARMSTRONG Turning Tool

With a few bits that any mechanic can quickly grind from stock shapes of high speed steel, this holder equals a dozen forged tools. It is one of the hundreds of sizes and shapes—ARMSTRONG Tool Holders for every operation on lathes, planers, slotters and shapers.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
309 N. Francisco Ave., CHICAGO, U. S. A

ARMSTRONG

Tool Holders
Lathe Dogs "C" Clamps
Ratchet Drills
High Speed Steel Bits
Drop Forged Wrenches
Chain Pipe Wrenches
Pipe Wrenches

ARMSTRONG BROS.

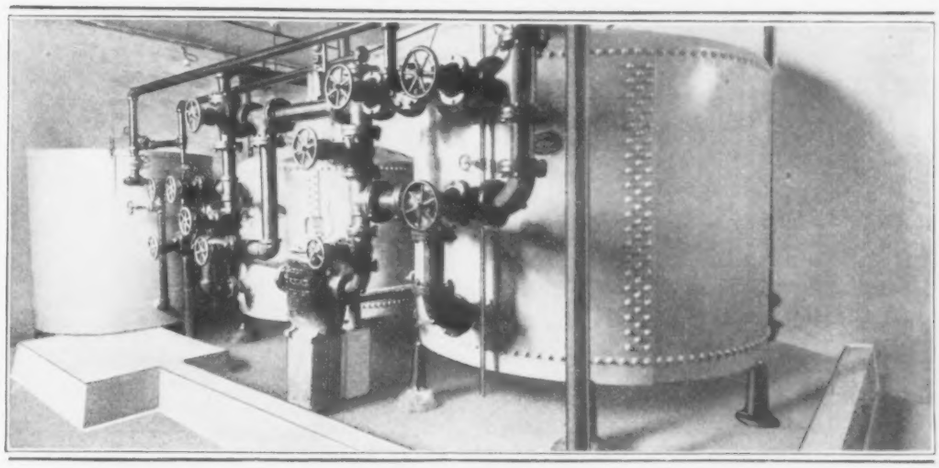
Solid Dies and Stocks
Adjustable Dies and Stocks
Ratchet Stocks
Triplex Stocks
Pipe Cutters
Chain Vises
Hinged Pipe Vises
Knife Blade Cutter Wheels



WRITE for Catalog B-27. Shows, describes and prices all ARMSTRONG Tools

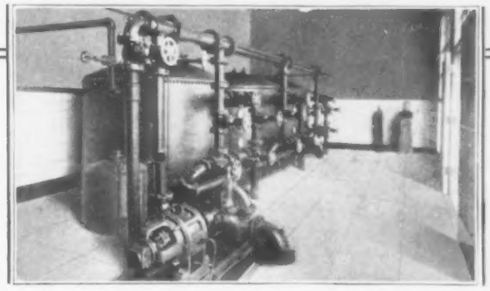
ARMSTRONG

TRADE MARK REG. IN U.S. PAT. OFFICE



NEVER MIND THE INVESTMENT

IT'S THE SAVINGS THAT COUNT



Either you need water-treating equipment or you don't. If you *do*, there's no reconciling the price of *doing without*.

Graver has proved, thousands of times, that the true measure of the value of water-treating equipment is not *cost* but *savings*. Graver equipment can demonstrate its dividend-producing ability for you if you have a water problem.

GRAVER TANK & MFG. CORP.

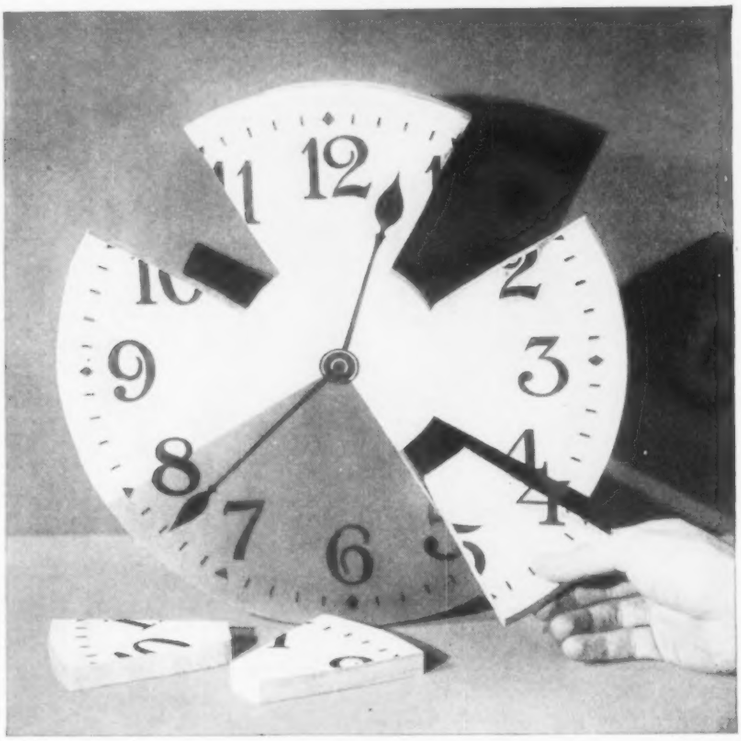
East Chicago Indiana



Graver is one of the leading fabricators of special steel plate construction. Tanks, special pressure vessels, stacks, breeching and the most intricate fabrication are familiar problems to Graver engineers and Graver shops.

GRAVER

WATER TREATING EQUIPMENT



SAVE ONE HOUR IN EVERY THREE

BY HIGH SPEED GRINDING

Snagging always adds to the cost of castings — but adds nothing to the price that you get for them. Every minute that you save in grinding time adds just that much to your profit. The use of resinoid bonded wheels, operating safely at 9,000 S.F.M., instead of the customary 6,000 S.F.M. saves one hour in every three — and cuts grinding costs one-third or more.

Resinoid bonded wheels are so strong that they provide a very liberal margin of safety even at speeds of 9,000 S.F.M. The structure of the wheels is so porous that they do not get hot at any operating speed. The bond does not soften or gum. These wheels are setting astonishing economy records in hundreds of plants, on many classes of work.

Resinoid bonded abrasive wheels and discs are widely used for snagging and cut-off work, and for many other grinding operations, including those on automatic and semi-automatic grinders. Abrasive wheel manufacturers will gladly study your grinding operations and recommend the most efficient equipment and wheels for your work.

Abrasive wheels bonded with resinoids made by Bakelite Corporation are produced by all the leading manufacturers. Names on request.

BAKELITE CORPORATION, 247 Park Avenue, New York
CHICAGO OFFICE, 635 West Twenty-second Street
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario

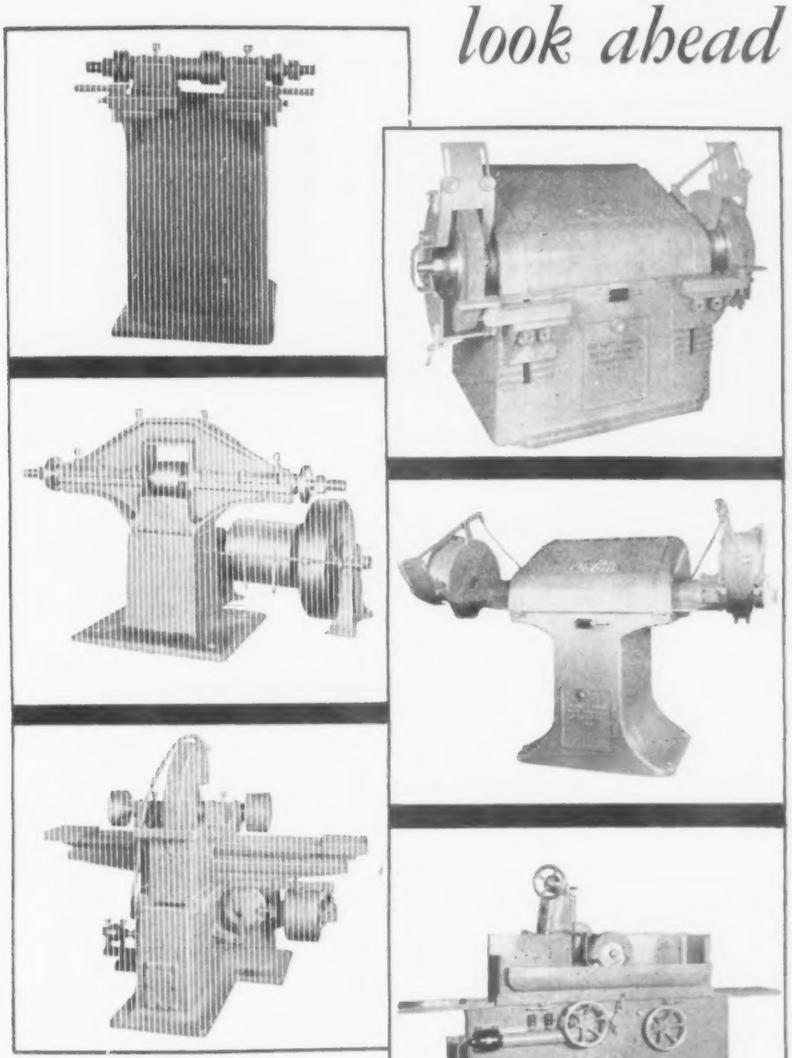
BAKELITE

REGISTERED U. S. PAT. OFF.

"The registered Trade Mark and Symbol shown may be used only on products made from materials manufactured by Bakelite Corporation. Under the copyright "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products."

THE MATERIAL OF A THOUSAND USES

It is interesting *to look back • but more* profitable *to look ahead*



In the "good (?) old days" these were good enough

. . . but only such equipment will show a profit in 1931

Changes take place so gradually that we commonly fail to realize their extent or significance except as we view them in retrospect over a considerable period, contrasting the obsolete with the present.

For nearly forty years this company has been pioneering in the development of improved methods and materials and machinery for more efficient and more economical grinding. The original "SAFETY" Collar, which has long since become the accepted standard in the industry . . . the motor-driven portable originated by us for the grinding of unwieldy pieces . . . more recently the famous "Rite-Speed" grinder for *enforcing* correct surface speed maintenance as wheels wear away . . . within recent months the "Perfec-Hole" lead bushing for large-hole wheels . . . these and many other fundamental improvements have been—and continue to be—important contributions of SAFETY engineers to the metal-working industries.

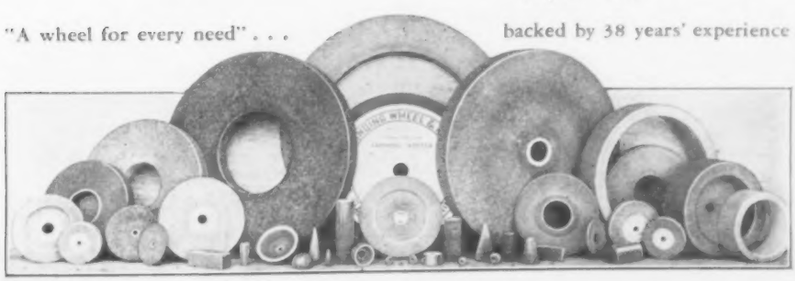
In these days of progressively more intensive competition, alert acceptance of the latest improved methods and equipment becomes increasingly more vital to the net profits that measure success. Are *you* struggling against the handicap of deficient and obsolete equipment—less spectacularly but none the less seriously antiquated than shown in these contrasting illustrations from our "family album"?

Our many years of experience are at your command in obtaining a dispassionate appraisal of your facilities for Profits in 1931. The SAFETY Grinding Specialist assigned to your territory will be pleased to advise with you. "Say when," won't you? You will be glad you did. It is a step toward a Happy New Year.

THE SAFETY GRINDING WHEEL & MACHINE COMPANY

2313 Columbus Ave. Springfield, Ohio

"A wheel for every need" . . . backed by 38 years' experience



SAFETY TRADE MARK

0-28

KINNEAR ROLLING DOORS

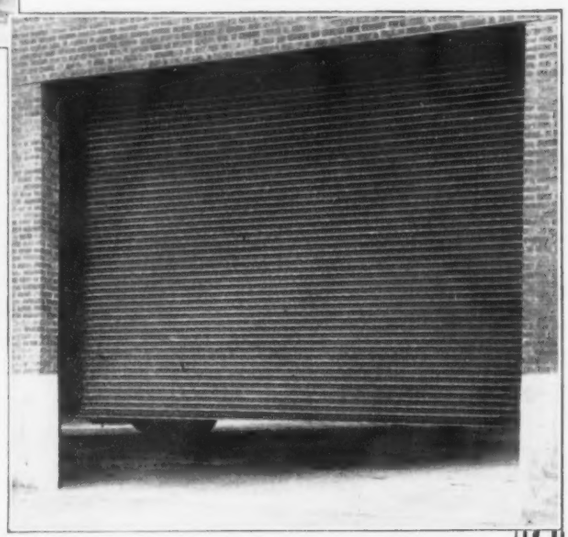


used . . .
. . and endorsed
by

UNITED ELECTRIC
RAILWAYS CO., Providence, R. I.

Winner
1st AWARD
Class A, Bus Transportation
Maintenance Award
for 1930

Photos of KINNEAR DOORS in their
. . . . . NEW Bus Terminal Garage



PRECISION ENGINEERING

kinnear
ROLLING DOORS

So Do All Firms Who Will Be Satisfied
. . . . . *with nothing short of the* **BEST**

And there is a very good reason for this: . . . Kinnear turns out no "stock" patterns . . . every Kinnear Rolling Door is made to order—*engineered* to the particular requirements of each job. Besides—Kinnear *originated* the interlocking slat steel vertical rolling door . . . and . . . its entire plant, occupying over 12 acres, has always concentrated its entire energies on *perfecting* just one product—ROLLING DOORS . . . Send today for your free copy of the illustrated Kinnear catalog and details of Kinnear Engineering and Estimating Service available without cost or obligation.

PRECISION ENGINEERING

THE KINNEAR MANUFACTURING CO.
817-867 Field Avenue, Columbus, Ohio, U. S. A.

Boston Chicago Cincinnati Cleveland Detroit New Orleans
New York Philadelphia Pittsburgh Kansas City Washington

CORNELL ROLLING DOORS

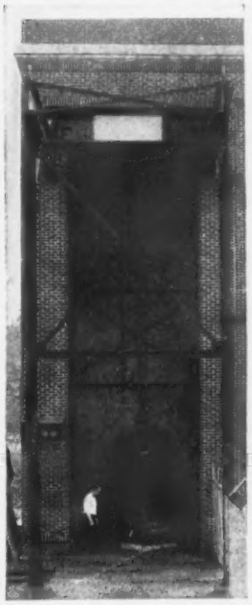
RUGGED ALL-STEEL GUARDIANS
against
WEATHER, FIRE and THIEVES

Cornell Rolling Doors have been manufactured since 1854, standing the acid test of seventy-six years' experience.

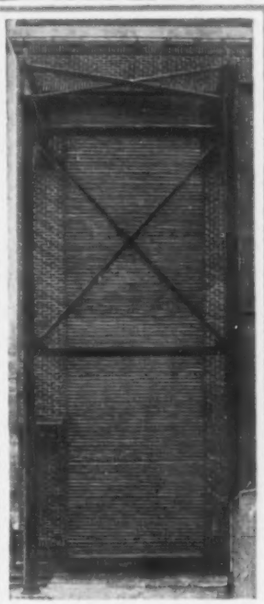
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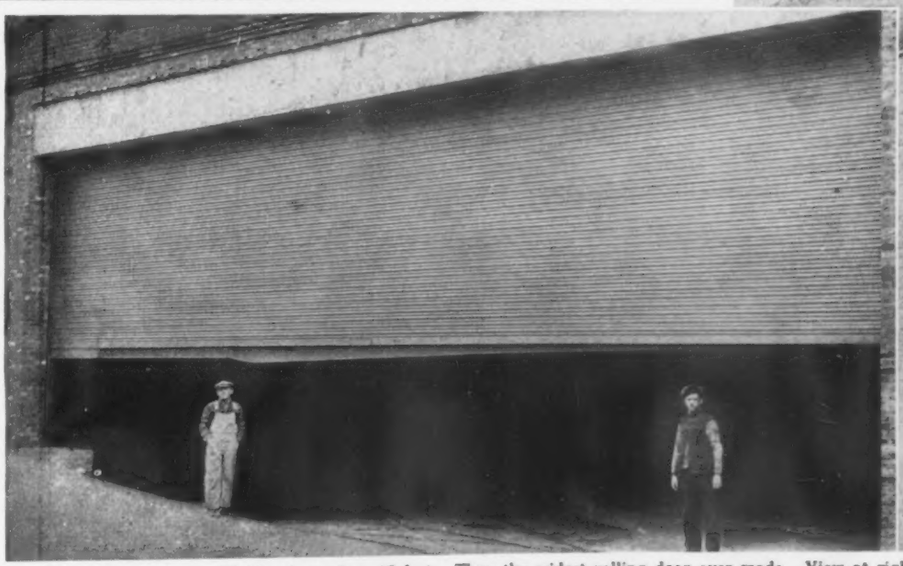
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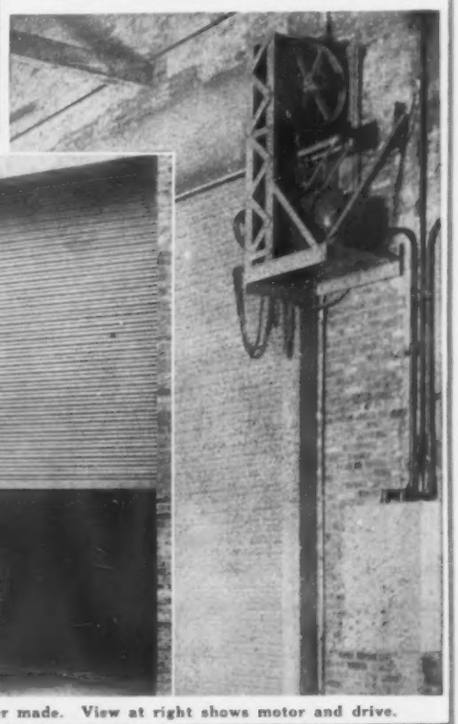


Motor driven, 35 feet high



Craneway door. Door closed.

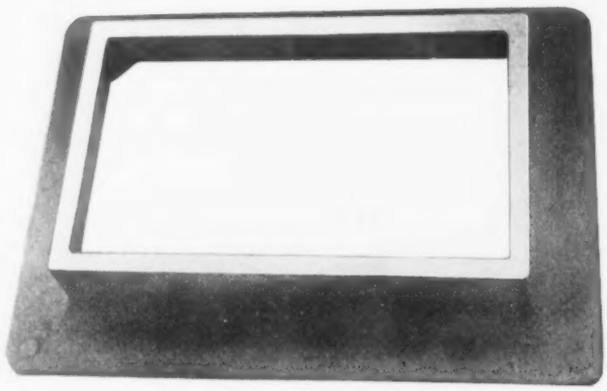




Motor-driven door. Width of opening, 45 feet. Then the widest rolling door ever made. View at right shows motor and drive.

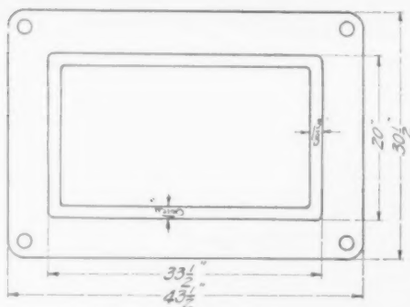
How Grinding Beat Planing by 81%!

A Typical Example



The base casting at the right was formerly planed at a cost of $1.70. By grinding this heavy piece on a Bridgeport Hydraulic Face Grinder the cost dropped immediately to $.31—an 81% reduction; and better finish results were obtained in the bargain.

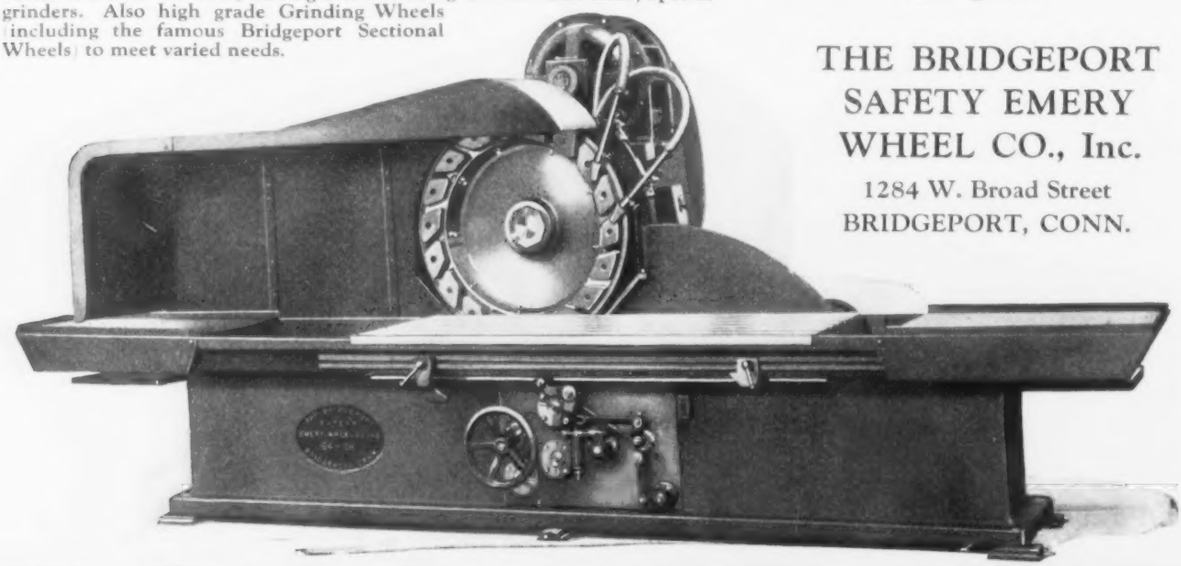
This example is typical. For thousands of jobs, grinding is far more economical than ordinary machining methods. Bridgeport's powerful, hydraulic feed table—capable of speeds up to 85 feet per minute—Timken Bearing Spindle, Bridgeport Sectional Grinding Wheels and many other features have given grinding a new "place in the sun."



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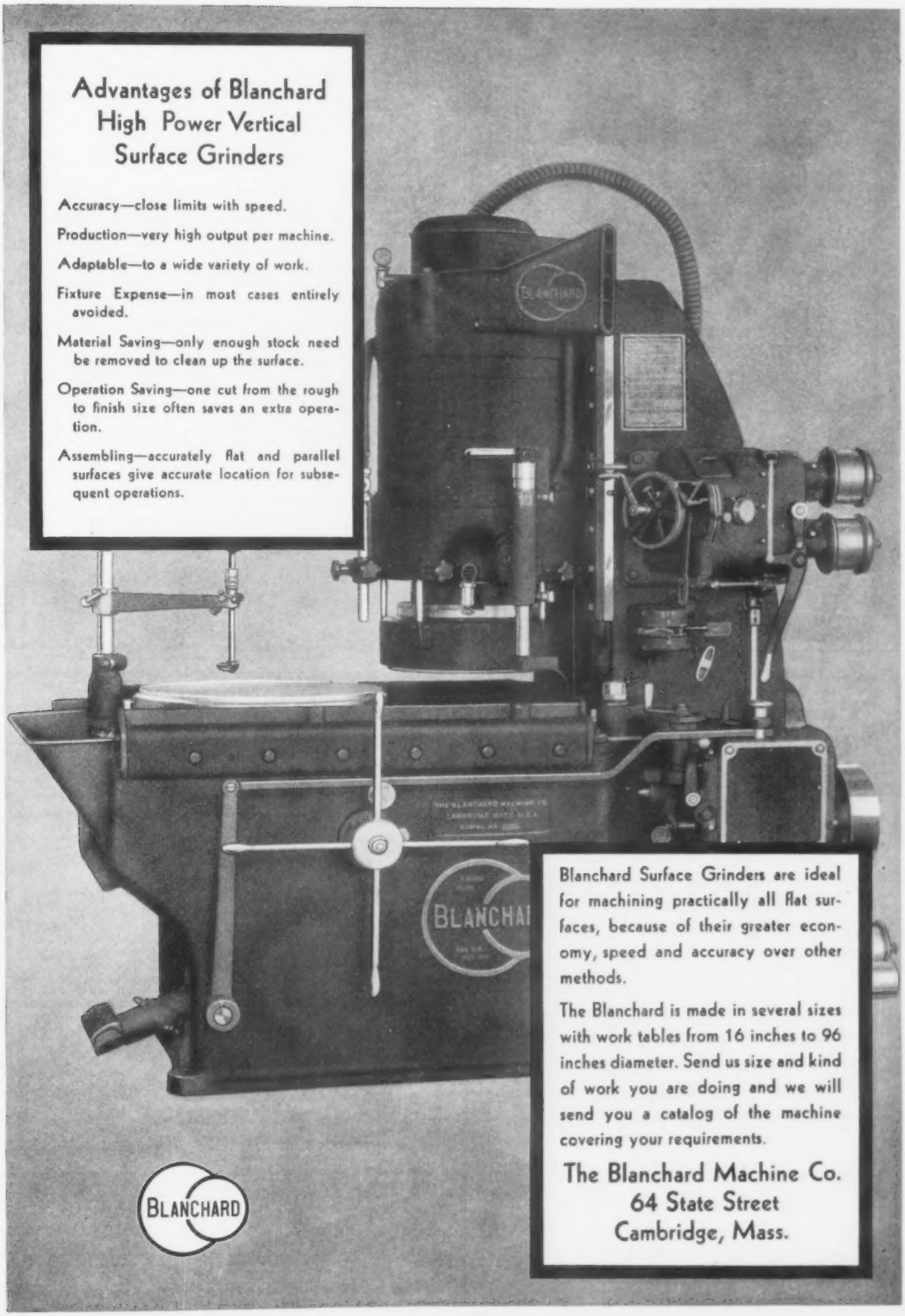
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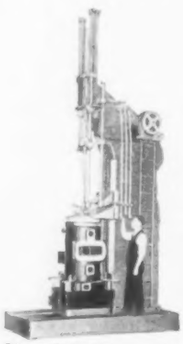
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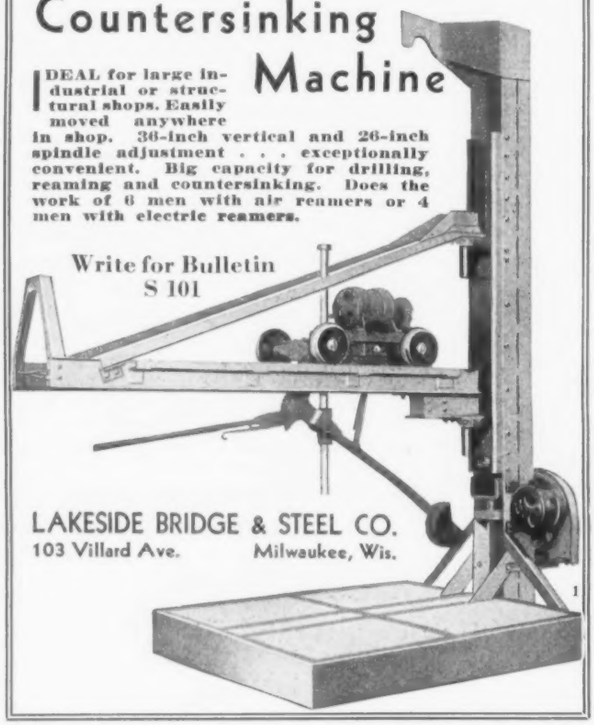
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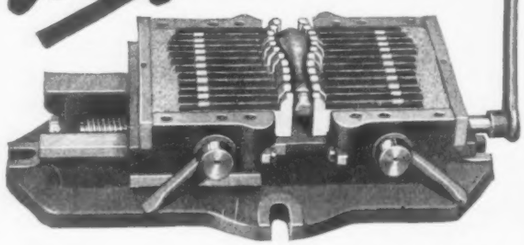


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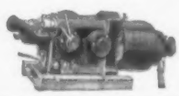
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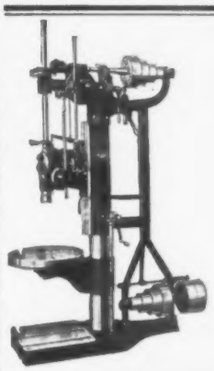
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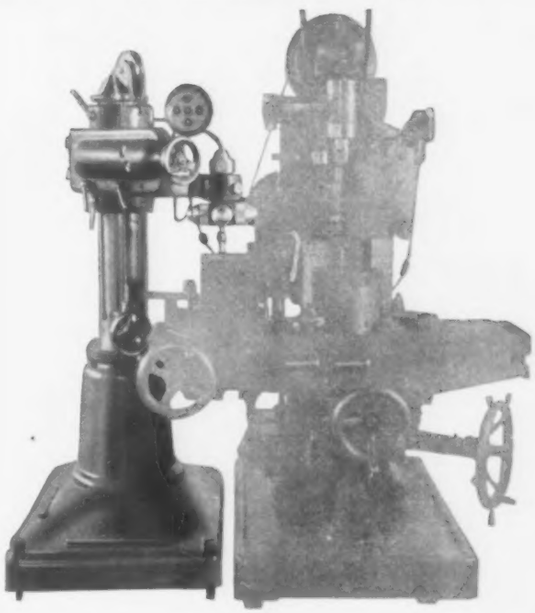
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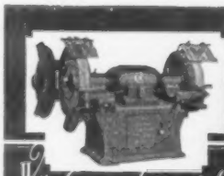
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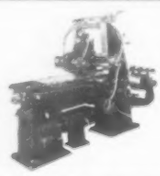
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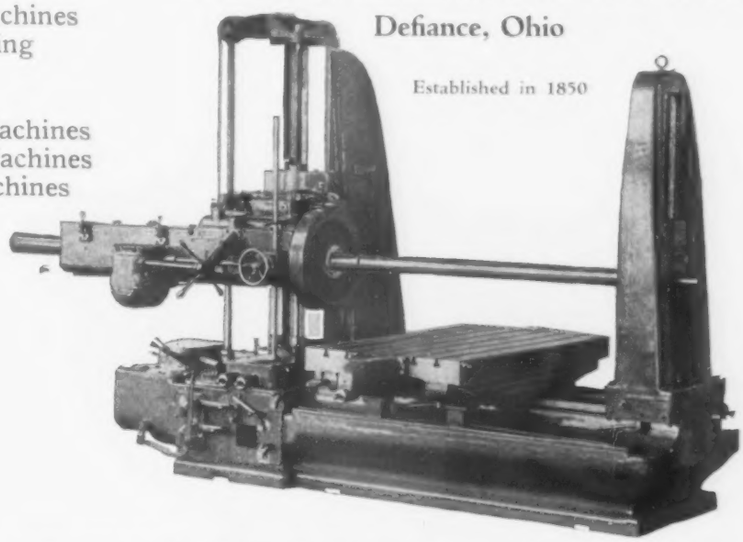
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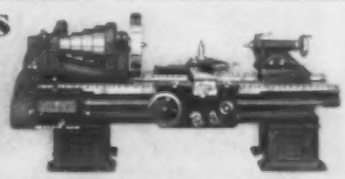
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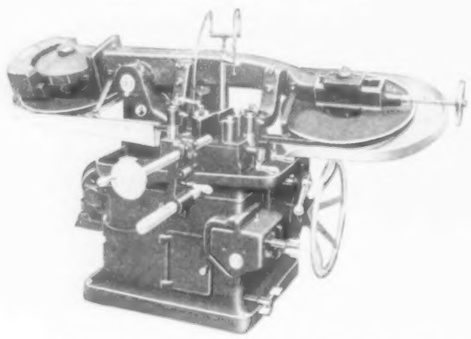
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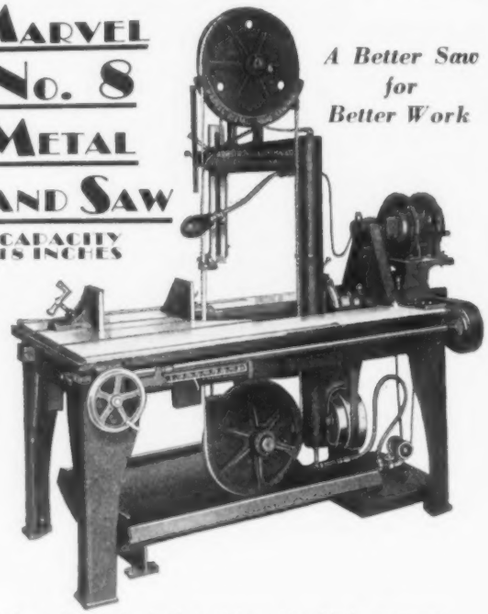
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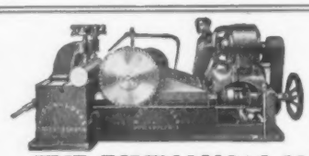
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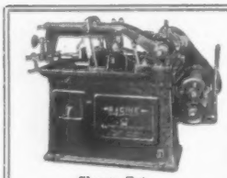
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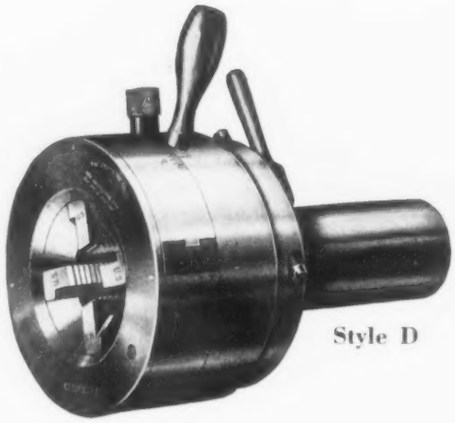
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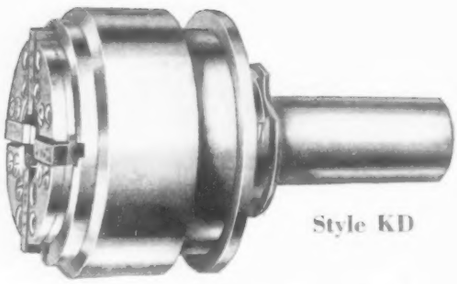
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For Light Duty Threading—Style C.
For Taper Threading—Taper Die Heads.

7 distinct types of Die Heads



Style D



Style KD

K Line of Tools

Style KD—A Spool Trip Die Head for Live Spindles such as Automatic Screw Machines, Threading Machines, Drill Presses, etc.
Style KH—For Hand Machines.
Style KJ—A Solid Adjustable Die Head.
Style KL—A Lever Trip Head For Short Threads.
Style K—A Button Trip Rotary Head.

Complete Chaser Interchangeability

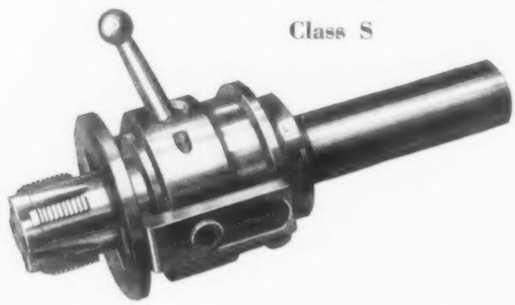
Taps

A Universal Collapsing Tap—For any machine and most any job—Class S.

A Solid Adjustable Tap—Class SJ.

A Receding Chaser Tap for Taper Tapping—Class R.

Class S



Threading Machines **Complete Chaser Grinders** **Chaser Grinding Fixtures**

Let our engineers help you pick the most economical tool for your work.

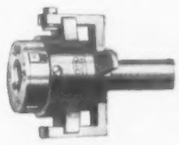
THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN.

Exclusively Manufacturers of Threading Tools for Over 35 Years

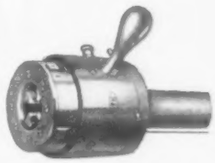
Quality Threads
and dependable performance

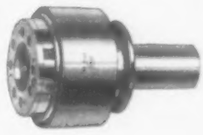
◆◆◆◆◆◆ H & G Die Heads are famous for: 1, Quality of threads produced; 2, High production possibilities; 3, All around dependability . . . . The reason is simplicity of construction—the manner in which chasers are solidly supported and positively opened . . . . All styles of H & G Die Heads use the same chasers thus simplifying chaser stock . . . . There is a size and style of H & G Die Head for all types of machines on which threads are cut . . . . Standardize on H & G for thread cutting.



Style D
Head for Brown & Sharpe Automatics and other small machines.

Style C
Hand closing Die Heads for hand turret machines.





Style EE (Rotary)
Designed for automatics, threading machines and bolt cutters; where the die head rotates.

Chaser Grinder
Designed to regrind H&G Chasers on chamfer and cutting faces; it insures better threads because chasers may always be ground correctly.





Threading Machine
Designed to produce quality threads at high speeds and low cost. Two or more machines may be mounted on one base.

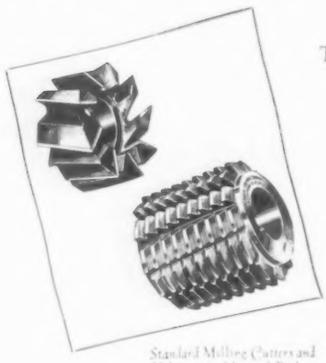
H & G DIE HEAD

H & G Feed Pushers for
Automatic Screw Machines—
1—Positive grip
2—Provide uniform feed
3—Eliminate rebound
4—Eliminate drag marks
5—Have extraordinary life
6—Permit feeding at high speed
Write for literature

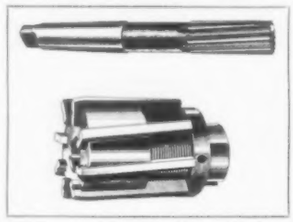
THE EASTERN MACHINE SCREW CORP. . . . New Haven, Conn.

BARBER-COLMAN PRODUCTS

The illustrations on this page reflect the scope of BARBER-COLMAN service to American manufacturers



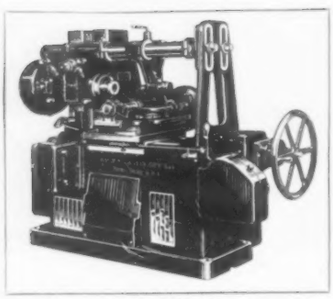
Standard Milling Cutters and Hobs are widely used Barber-Colman Products



Standard and Special Type Reamers of both fluted and inserted tooth types, are important items in the Barber-Colman line

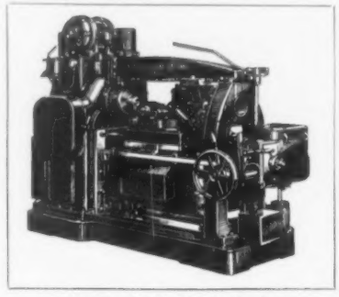


We also manufacture special milling cutters and hobs to meet the most exacting requirements

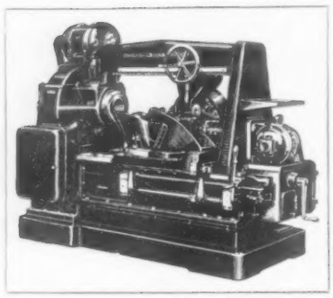


This is the No. 12 Barber-Colman Hobbing Machine for generating spur and helical forms

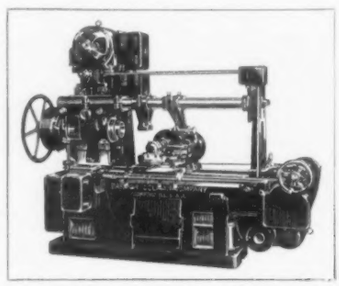
Since 1908, when the Machine and Small Tool Divisions of Barber-Colman Company were established, this company has maintained a forward-looking policy in the development of all of the products it has manufactured for American industry, whether these be its Hobs, its Hobbing Machines, its Reamers and Milling Cutters, or its Hob Sharpening or Reamer Sharpening Machines. Sound engineering, correct design, the finest of materials, and the best possible workmanship are incorporated into these Barber-Colman Products, with the addition of that intangible something which has prompted us to set quality and precision standards always a trifle ahead of today's best possible attainments. This, we think, is more than merely keeping abreast of the times. Rather it is a spirit of keeping always ahead of tomorrow's demands . . . And this policy, and this only, can spell progress.



This Type B Hobbing Machine handles arbor loads up to 12"x12" in size. For spur forms only



Here is the Barber-Colman No. 17 Hobbing Machine, which is a limited purpose machine for spur forms

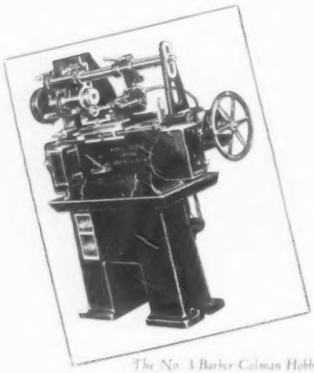


And here is a special No. 12 Hobbing Machine—used for production hobbing of spline shafts.

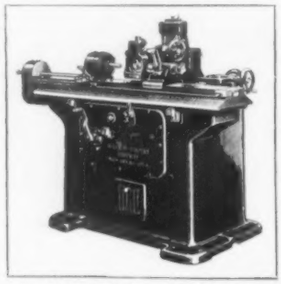
BARBER-COLMAN COMPANY

General Offices and Plant

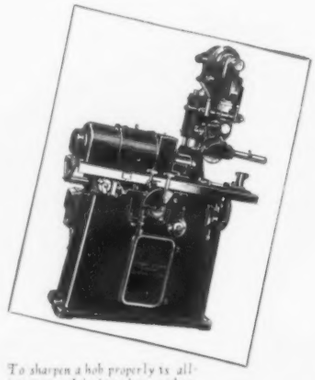
ROCKFORD, ILL., U. S. A.



The No. 3 Barber-Colman Hobbing Machine for spur and helical forms, is widely used in industry

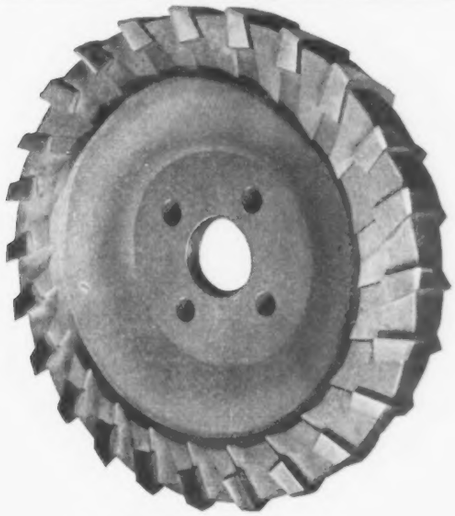


An important development in the Reamer field is the Barber-Colman Reamer Sharpening Machine

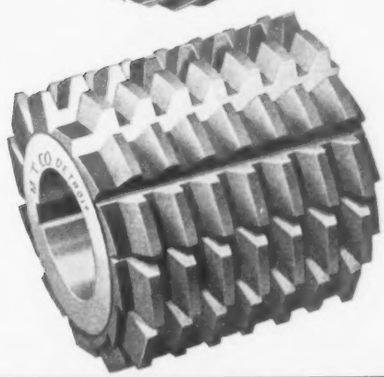


To sharpen a hob properly is all important. It's best done with a Barber-Colman Hob Sharpening Machine

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The Michigan Tool Company can be the satisfactory answer. They have proved their worth since 1915. Each year a little better—each year more completely.

1930—marked the development and announcement of a better, more accurate hob than ever before produced.

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MICHIGAN TOOL COMPANY

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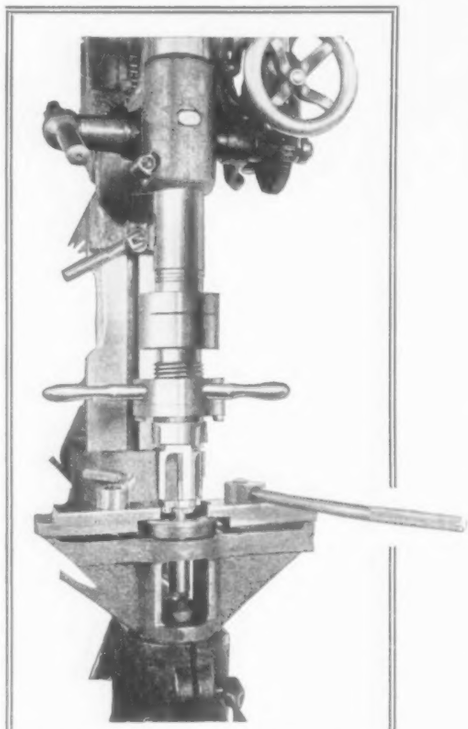
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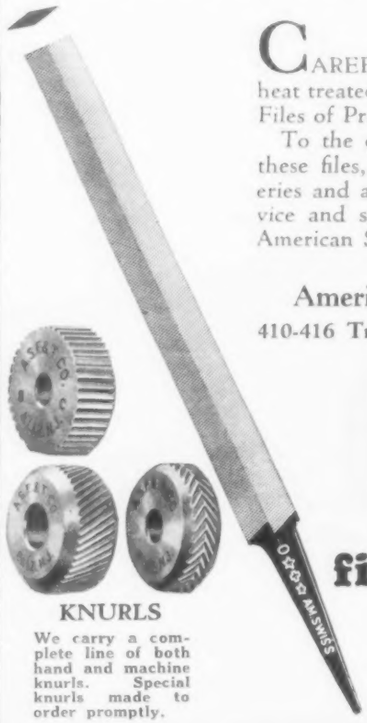
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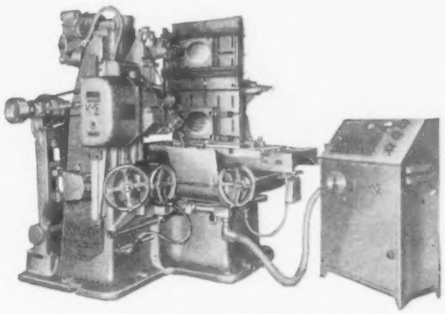
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First Appearance!



Well-known Keller Automatic Tool Room Machine. Type BL-2416

A NEW MACHINE for Small Dies and Tools

In the new small Keller Automatic Tool Room Machine appears the first machine designed specifically for the speedy, economical and *automatic* production of dies and tools with impressions within limits of 12" x 10". Its field includes such types of work as blanking dies and punches, extrusion dies, piercing dies, some types of molds.

This new machine employs the tested and proved principles of the larger Keller Machine—one of which is here illustrated. It possesses a high degree of operating speed and precision—is constructed with the same combined ruggedness and sensitivity. In addition, it has a greater facility of operation on small work, and a reduction in bulk that immensely widens its field.

We will gladly furnish more details upon request.

KME

KELLERFLEX

The Machine of a Hundred Uses

Here is a genuine flexible shaft machine—one of a series of flexible shaft machines that are really *flexible*.

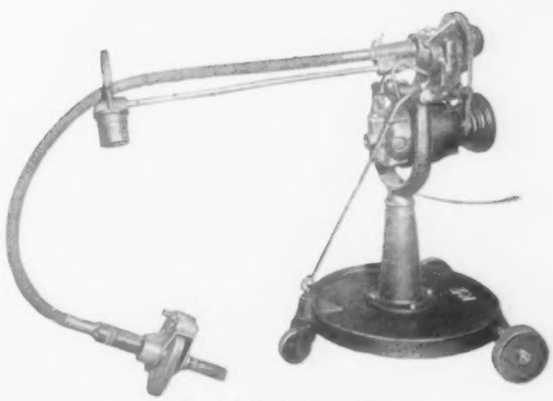
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Built from ¼ to 1 H.P. . . . Supplied with a complete set of accessories—rotary files, grinding wheels, sanding and polishing equipment—in all sizes and shapes.

An indispensable tool for all die and mold work . . . for the pattern, machine and body shop . . . for the foundry . . . for welding . . . for straight-line production.

The Kellerflex is, indeed, the ideal flexible shaft machine of a hundred diversified uses.

Write for complete information.



1 H. P. Kellerflex Type JR-5

KELLER MECHANICAL ENGINEERING CORP.

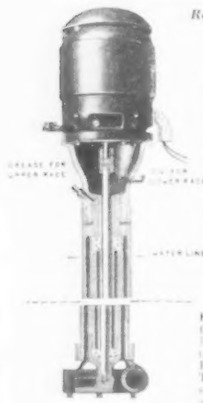
78 Washington Street, Brooklyn, N. Y.

How Much Does it Cost?

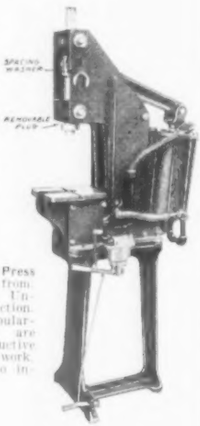
PRODUCTION costs are getting serious consideration today! Obsolete methods—obsolete machinery are "getting the gate." Cost sheets are being scanned constantly—thoroughly. Plant executives today are turning to HOPKINS Air-Operated Cylinders (Non-Rotating, Tubular Type) for the solution of production problems. Profitable time, energy and lost motion are being SAVED by the use of Nature's cheapest productive factor—AIR. Let us help you, too. Write for engineering data!

The Tomkins-Johnson Co., Jackson, Mich.

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HOPKINS Air-Operated Arbor Press (right). Eight sizes to choose from, 7,000 to 78,800 lbs. pressure. Unusually rigid, sturdy construction. HOPKINS Non-Rotating Tubular-Type Air-Operated Cylinders are standard equipment. Fast, productive and operates on a wide range of work. Cylinder sizes can be changed to increase or decrease pressures.



HOPKINS Non-Rotating Tubular-Type Air-Operated Cylinder. Save time, energy and lost motion in machine-control operation. Available in three other styles. Let us show you how to apply these cylinders to your specific machinees.



HOPKINS Series "C" Air Cylinder. Box pistons utilize every particle of compressed air. Only 5 packings, each automatically sealed by compressed air. No adjustable packing glands.



HOPKINS Three-Jaw Chucks. Also available in two-jaw style. Many exclusive features.



HOPKINS Series "B" Air Cylinder. Similar to Series "C" above, except control is by operating valve.

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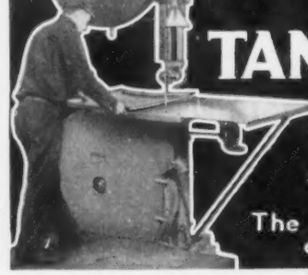
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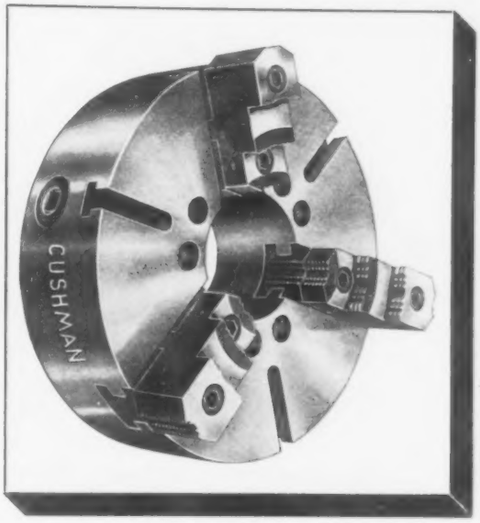
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Higher speeds and greater production demand Lathe Chucks of greater strength and gripping power—and CUSHMAN is ready to meet *modern requirements.*

We have the facilities, the equipment and the engineering skill to design and build Chucking Equipment for the many New Special Purpose Tools as well as for all machines of standard types.

In fact, we are READY to produce Lathe Chucks for every conceivable purpose, and remember—

There are 65 years of Specialized Chucking Experience in back of every Cushman Lathe Chuck. We offer our services to all who have need of them.

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We build Chucks for Lathes of every description

No. 2 of a series

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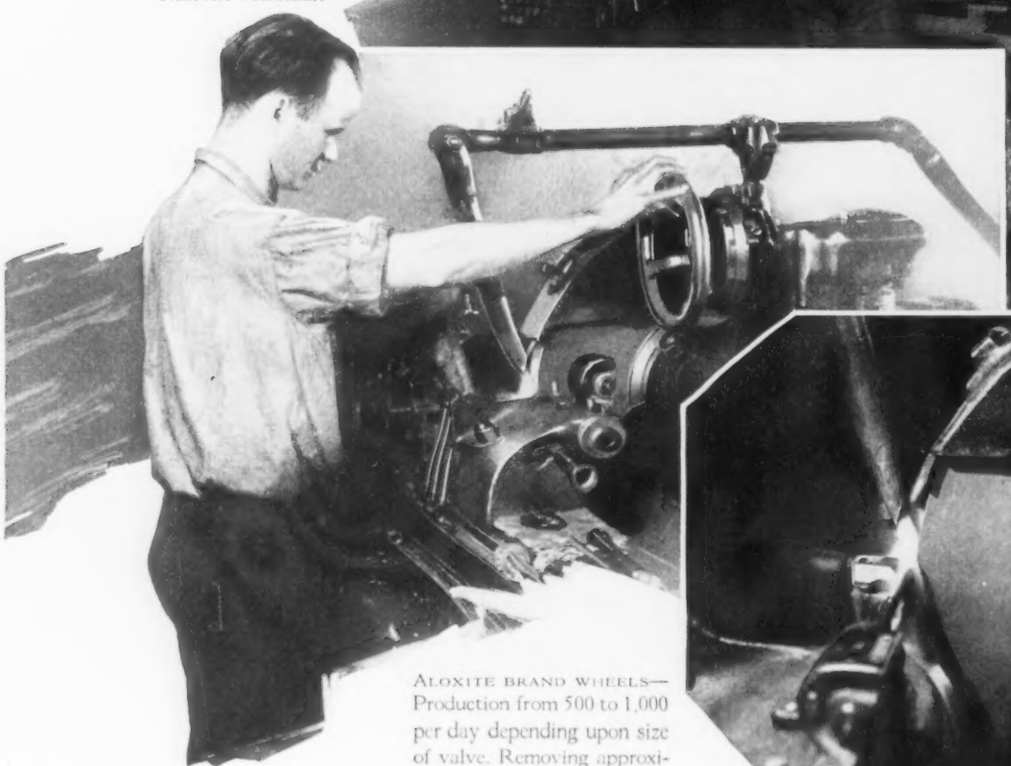
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ALOXITE BRAND WHEELS—Production from 500 to 1,000 per day depending upon size of valve. Removing approximately .020" to .025" in roughing—.003" in finishing.

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ALOXITE BRAND WHEELS on Cincinnati Centerless Grinders—Production 800 to 1,000 valves per hour. Removing approximately .010" in roughing—.002" in finishing.

SERVING a plant that turns out 150,000 valves a day—an organization that is one of the largest producers of valves in the world and a company whose name and reputation are written large in the history of the motor industry—that is distinction indeed.

The combining of the resources and the research of three companies, The Rich Steel Products Co., The Rich Tool Co., and the Wilcox Products Corporation—has resulted in the present great industry, the Wilcox-Rich Corporation, producers of "Rich" valves for a great percentage of today's motors.

In their Battle Creek and Marshall, Michigan Plants, Aloxite Brand Grinding Wheels are among their valued production tools. On Cincinnati Centerless and Landis machines they are extensively used in the accurate grinding of "Rich" valve stems made of Silcrome.

Here again is an instance of the unquestioned ability of these wheels to combine speed, accuracy, finish and production. Here again is an instance of a great plant in which Carborundum Brand Products and grinding wheel service mean much.

Niagara Falls, New York

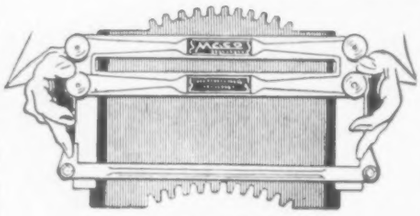
CO., LTD., NIAGARA FALLS, ONT.

Cleveland, Detroit, Cincinnati, Pittsburgh, Milwaukee, Grand Rapids, Toronto, Ont.

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USE THE MACO ADJUSTABLE TEMPLATE

for Exact Profile Reproduction

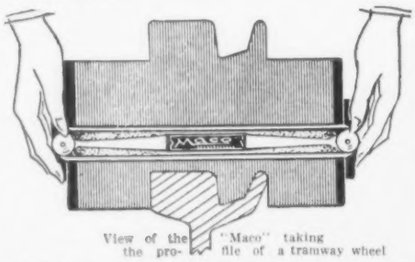


View of the "Maco" after taking the profile of a cog-wheel

Takes every detail of the most complicated profile quickly and easily.

Abolishes hours of tedious work, in iron, steel, wood or composition.

Write for full details.



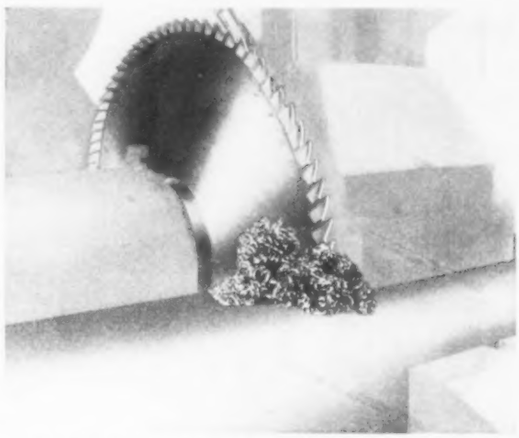
View of the "Maco" taking the profile of a tramway wheel

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SEGMENTS and BLADES

Meet the demand for High Speed Cutting of the toughest materials—will do more work and last longer.



BLADES, SEGMENTS AND SHARPENING MACHINES SUPPLIED FROM NEW YORK STOCK

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AMERICAN REPRESENTATIVE

CLEVELAND
CLOSE QUARTER DRILLS



Made in 2 Sizes 38 and 49 with Nos. 3 and 4 Morse Taper Sockets Respectively.

Will Drill Closer to Wall or Corner Than Any Drill Made

The body and cylinders are cast en bloc—one-piece-construction — insuring perfect alignment of all working parts. The V-shaped front-head makes the drilling in corners easy.



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"HELWIG" Pneumatic and Hand-Operated Tools are highly appreciated,—and standardized by Users, for their exceptional Time-and-Labor-Saving advantages and superiority.

The "HELWIG" Metal Pressing Tool by simple hand Pressure Binds Standing Seams in Sheet Metal Work, such as Cornices, Skylights, Ventilation Systems, etc., and locks the seam perfectly. Requires no skilled help.

"HELWIG" Safety Wire Cutter—Non-conductive, is an Ideal Tool on Electric Construction Work. Powerful. Cuts with ease and perfectly.

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"HELWIG" Box-strapping Shears.

Other Tools of Equal Merit. Circulars on Request.

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SPEEDS UP PRODUCTION





Quick-As-Wink Valve Coupling is the first and only quick-acting coupling which also controls the air.

Anywhere on the air line — from pipe to hose — or from hose to tool — the operator can "turn on" the air right at the coupling — and tool or hose cannot be disconnected as long as air is on. When he shuts off the air at the coupling, all pressure beyond that coupling is automatically bled.

All essential parts of stainless steel—for long service and freedom from theft. A full range of airline sizes also in the Quick-As-Wink Valves — (without swivel quick-acting coupling) for use on air operated machines.

Quick-As-Wink Valves and Valve Couplings are being adopted extensively for air lines and tools thruout the metal working industries.

They are carried by leading mill supply houses. Write us direct for information regarding the application of Quick-As-Wink Valves to your job—or for name of your nearest distributor.

Quick-As-Wink
CUSHION ABRASIVE WHEEL

Quick-As-Wink Cushion Abrasive Wheels make high speed buffing and polishing safer, do better work and reduce costs as much as 50%.

The extra investment and continuous nuisance of refacing rag buffs are overcome by curing a thick rubber cushion onto a steel or Lynite drum by a special process. No amount of heat or speed can cause any part to loosen, break or "blow up".

They can be run at definite speeds, because they are always round, of unchanging diameter and accurately balanced.

Quick-As-Wink Wheels are being used extensively in metal working industries. A large percentage of all stainless production—at mills and by fabricators—is being polished the Quick-As-Wink way.

Carried by leading mill supply houses. Write us for folder giving sizes, recommended speeds, and for any special information about use of these wheels in your work.



Abrasive bands of any "grit" may be used — change being made in 30 seconds without removing wheel from spindle.



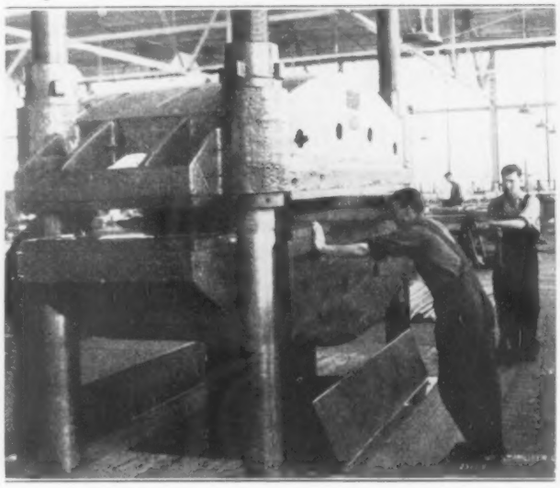
Made in 3, 4, 6, 8, 10, 12, 14, 16 and 18 inch sizes—wheels and drums — special sizes to order.

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HYDRAULIC MACHINERY SINCE 1851
ELMES
CHICAGO

PRESSES

1851—80 Years—1931



Pressing Stabilizer Covers—The operator (at right) has applied water pressure to the seven hundred ton Elmes hydraulic metal-forming press and a stabilizer cover made of duraluminum is being formed in the dies between the platen and the top head of the press.

ELMES Hydraulic Presses are used for the forming and streamlining of many aircraft parts. Although aluminum alloys predominate Elmes presses handle with equal efficiency, nickel and molybdenum steels, brass and copper. Thickness from .010" is formed and pressed into the many parts used in Aircraft.

When we stop to think of the complicated shapes, the laminated planks for structural steel members, the rigid, thin walls of corrugated metal parts, we realize they are of a formed or moulded product—the easy product of the hydraulic press.

The fuselage, the wings, the power plant, undercarriage, radio equipment, controls, instruments and furnishings are in whole or in part the offspring of the hydraulic press. *Elmes equipment may be adapted to a great number of essential aeronautical construction operations. Special products include:

EVERYTHING HYDRAULIC
for Aeronautical Production
Presses—Pumps—Accumulators—
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We Meet Nineteen Thirty One Advances in Machinery Design with Modern Machine Tool Equipment

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Never chip or upset in the hammer barrel. They are made of the highest grade Vanadium steel, hardened and tempered by our own process, and are the most economical rivet sets to use in the long run.

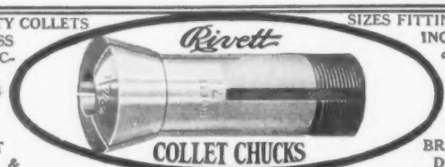
Our "VANADIUM" Rivet sets last longer than the ordinary kind and warrant your investigation.

Shipped on Approval
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QUALITY COLLETS AT MASS PRODUCTION PRICES



SIZES FITTING LEADING MAKES of BENCH LATHES AND ENGINE LATHES

RIVETT LATHE & GRINDER CORP.

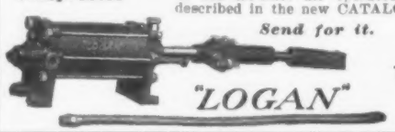
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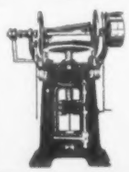
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V & O POWER PRESSES
AUTOMATIC FEEDS
AUTOMATIC THREADING MACHINES
THE V & O PRESS CO., HUDSON, N.Y.



Patent Percussion Power Presses

The Presses for hot pressed brass parts. Excellent for cold pressing, coining, etc.

Also all other types of Power Presses. Up-to-the-minute construction. Fully safeguarded. Automatic feeds.

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A vast selection of well-built, efficient tools from which to choose. Designed to meet your needs. A Toledo Press for every purpose.

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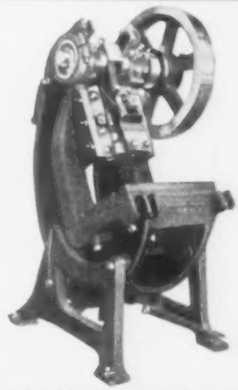
The "Toledo" Single Crank Toggle Drawing Press—Series No. 160. Built in 50 sizes from 7,500 to 500,000 lbs.

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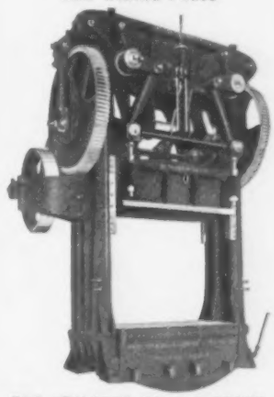
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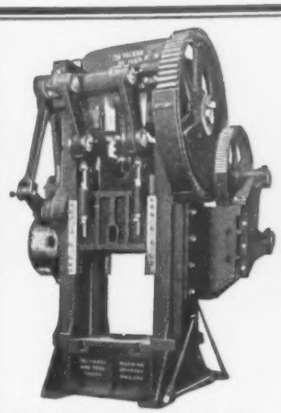
THE "TOLEDO" OPEN BACK PRESS



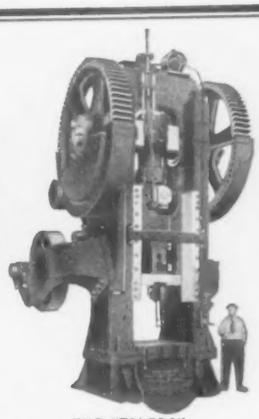
THE "TOLEDO" HORNING AND WIRING PRESS



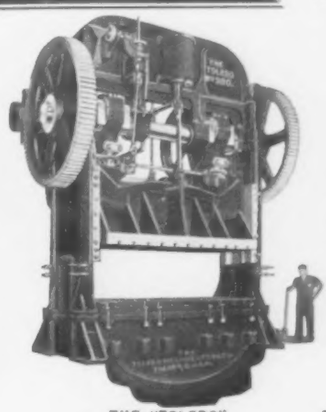
THE "TOLEDO" DOUBLE CRANK TOGGLE DRAWING PRESS



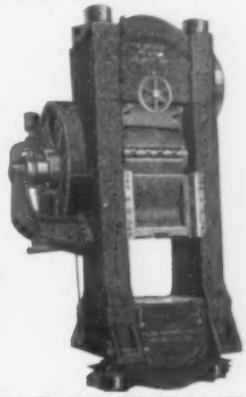
THE "TOLEDO" SINGLE CRANK TOGGLE DRAWING PRESS



THE "TOLEDO" STRAIGHT COLUMN PRESS



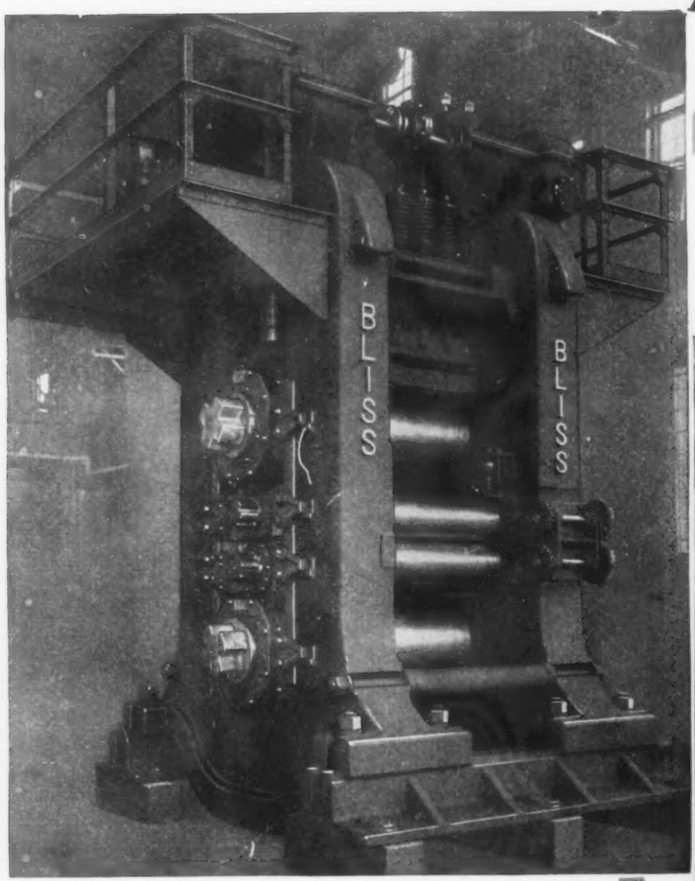
THE "TOLEDO" DOUBLE CRANK PRESS



THE "TOLEDO" KNUCKLE-JOINT EMBOSSING AND COINING PRESS

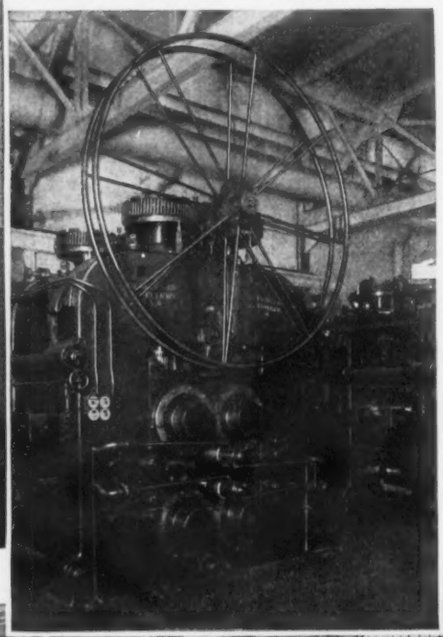
1857 TO 1931

BLISS *Industrial*

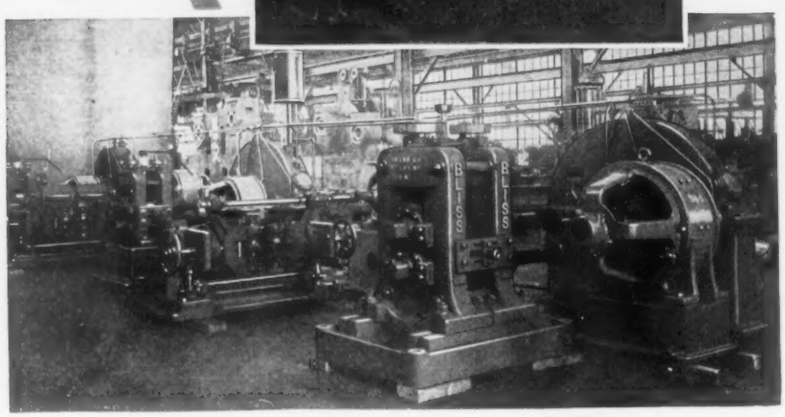


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BLISS CLUSTER MILLS
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Mills
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For 73 years Bliss engineers have been solving sheet metal problems—designing and building machinery for innumerable sheet metal operations with every conceivable requirement, thereby gaining an unequalled wealth of knowledge and experience.

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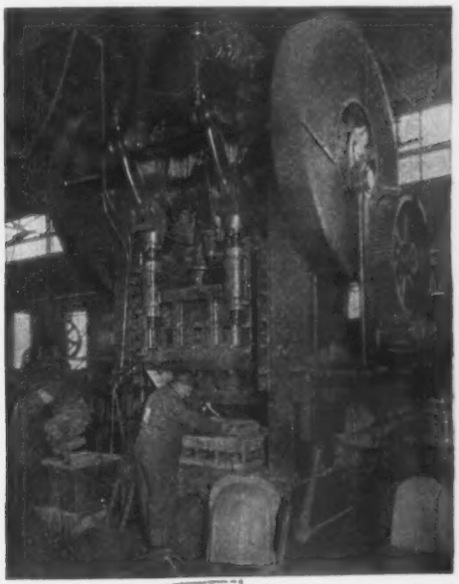
The unusual performances of the tens of thousands of Bliss installations in every part of the country prove the value of this vast background of experience. Bliss is standard equipment in many plants.

You can rely with safety upon the recommendations of Bliss Engineers.

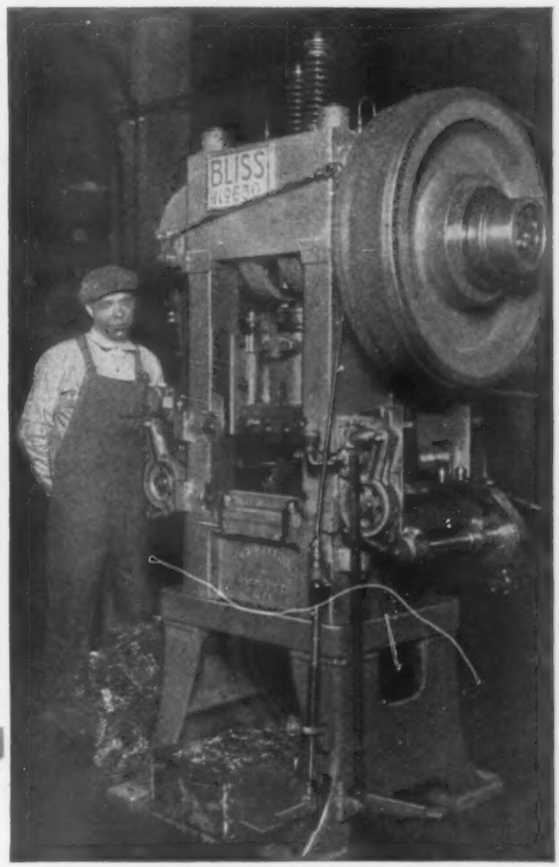
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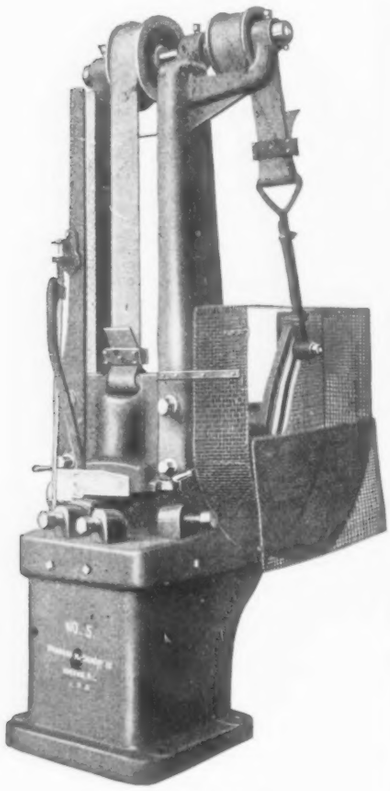


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"STANDARD"
Automatic
Drop Press

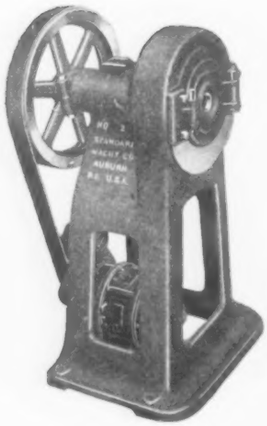
"STANDARD MACHINERY"

Manufacturers of

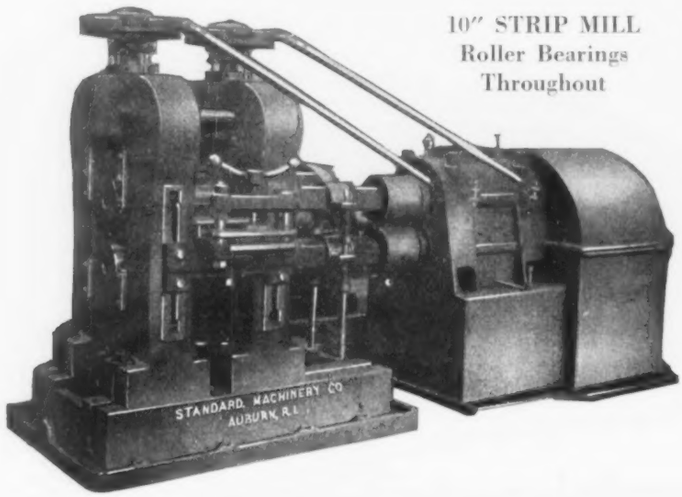
Single and Double Acting Power Presses, Cam Presses, Reducing Presses, Screw Presses, Plain and Automatic Drop Hammers, Rolling Mills, Wire Flattening Mills, Draw Benches, Wire Coilers, Rotary Swaging Machines, Rotary Shears, Miscellaneous Machinery, Ball and Roller Bearings, Foot Presses.

STANDARD MACHINERY CO.

AUBURN—RHODE ISLAND



No. 2A
SWAGING
MACHINE



10" STRIP MILL
Roller Bearings
Throughout

ROBERTSON LEAD PRESSES

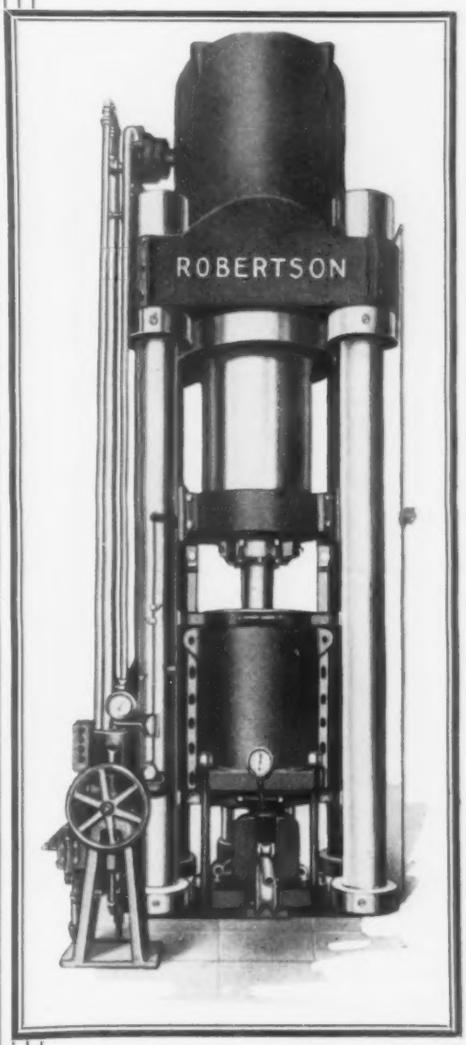
Robertson Lead Extrusion Presses are backed by seventy-three years of actual experience in the design, development and manufacture of this type of equipment.

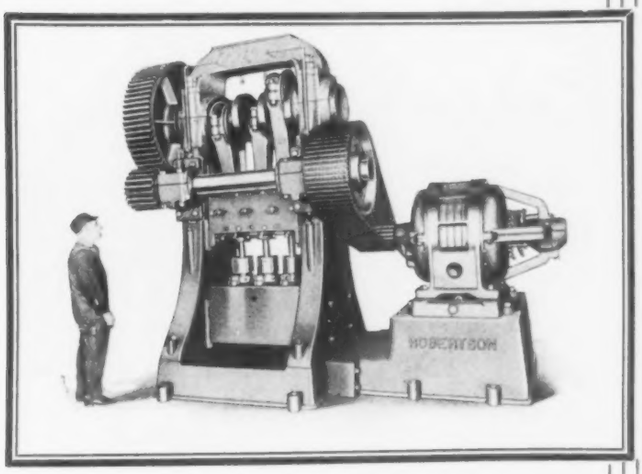
The first lead presses were used for the manufacture of Lead Pipe. In the beginning of the electrical cable industry, lead pipe in fifty foot lengths was used as the lead covering and it was pulled on to the cable by man power. The lead encasing die-block was then invented by John Robertson, the founder of this company.

Robertson lead encasing presses and equipment now apply the lead covering to telephone and power cables at the greatest possible speed and at the lowest cost.

Where productive capacity and quality of product are considered, manufacturers insist on Robertson equipment.

Used extensively in the United States and fifteen foreign countries.





PRODUCTS:

LEAD ENCASING PRESSES for electrical cables and rubber garden hose.

EXTRUSION PRESSES for lead pipe, lead traps, solder and lead wire, non-ferrous alloys, graphite, celluloid and other plastic materials. Electric carbons and carbon electrodes.

SHEET LEAD ROLLING MILLS.

HYDRAULIC PRESSURE PUMPS.

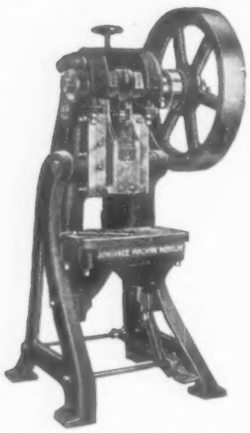
HYDRAULIC ENGINEERING PROBLEMS GIVEN SPECIAL ATTENTION.

JOHN ROBERTSON CO., Inc.
133 WATER STREET **BROOKLYN, N. Y.**

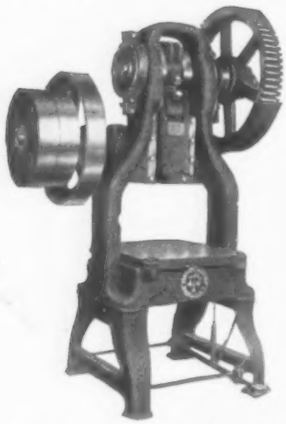
"ADRI

A Press for Every S

No matter what your sheet metal working problems may be, we have a machine to meet your requirements — Arch Power Presses, Straight Side Presses, Double Action Cam Presses, Power Punch Presses, Inclinable Presses, Double Crank Presses, Quadruple Crank Presses, Seamers, Horn Presses, Beading and Flanging Machines, Double Horn Presses, etc.

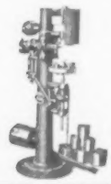


"Adriance" Inclinable Presses with vertical knockout and front adjustment, are accurate and powerful all-purpose power presses.



"Adriance" Arch Power Presses are especially adapted for cutting and stamping coal hod and tub bottoms, petroleum can sides, fire shovels, metal shingles, etc.

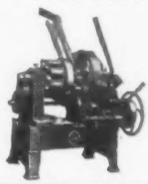
Round Double Seamer

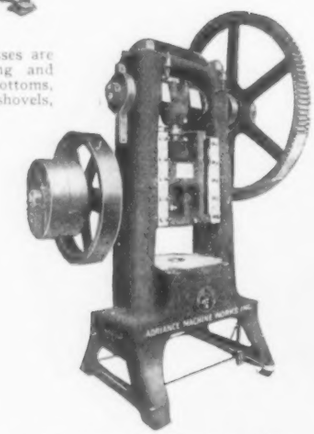


No. 126-D Square Double Seamer



No. 119-A Automatic Round Double Seamer



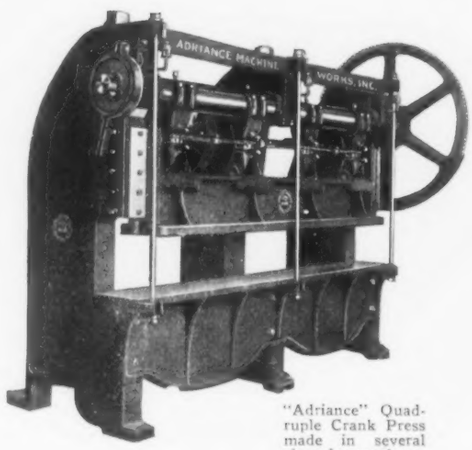


"Adriance" Straight Side Presses are designed to withstand the strains and stresses incurred in cutting and stamping sheet metal of the heavier gauges.



We have prepared a number of illustrated bulletins containing complete data on each type of press.

Tell us the kind of work you do, and we will gladly forward any or all of these bulletins.



"Adriance" Quadruple Crank Press made in several sizes for work requiring an extra wide bed.

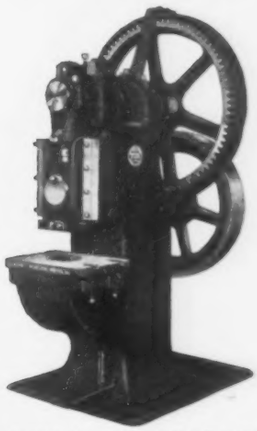
ADRIANCE MACHINE

ANCE"

Sheet Metal Job

Our large stock of standard presses assures immediate deliveries. Any press may be equipped with "Adriance" strip feeds, dial feeds, rectilineal feeds, roll feeds, stagger feeds, etc., making complete automatic units.

Our forty years of designing experience in the sheet metal industry have fitted us to meet your sheet metal problems.



"Adriance" Power Punching Presses are sturdily constructed all-round presses for punching, bending, forming, perforating—and with special attachments for piercing and riveting.



"Adriance" Power Press No. 405-0 with overhanging frame and inclined legs allows the finished pieces to slide through the uprights.

No. 175 Beading and Flanging Machine

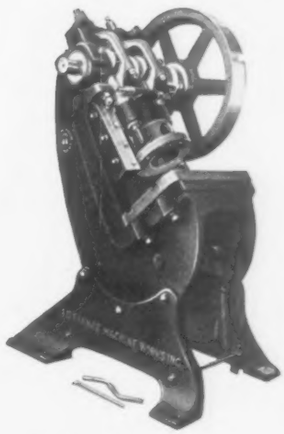


No. 24 Double Horn Press

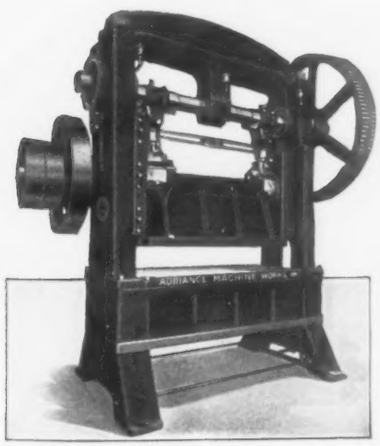


No. 25 Horning Press

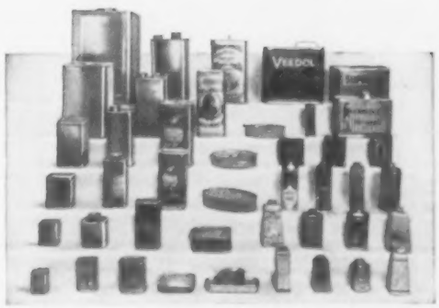




"Adriance" Double Action Cam Press with positive lift for comparatively small shells that are simultaneously cut and drawn in double action dies.



"Adriance" Double Crank Presses are designed for operating large cutting and forming dies or gangs of punches over large areas.



The illustration above shows some examples of the work done on "Adriance" square, oval and oblong Double Seamers. Our Horning and Wiring Presses are for grooving and closing side seams on cans of various shapes and sizes.

WORKS *INC.*, Brooklyn, N. Y.

BAL

That turn SCRAP HEAP LOSSES



NOPAK VALVES

FOR air, water, gas, oil and other fluids, Galland-Henning NOPAK Valves are unexcelled.

Will not stick. No contamination of fluids from valve lubricants. Leakless valve seats protected at all times. Discs definitely sealed whether Valve is closed or in operating position. Permits throttling. Easy to operate. No packing. No tapered plugs.

Learn true Valve satisfaction with the day you install NOPAKS. A few of the many users of NOPAK Valves include:

Allis-Chalmers Company,	Milwaukee, Wis.
American Steel Foundries	Chicago, Ill.
Bucyrus-Erie Co., South	Milwaukee, Wis.
Farrel-Birmingham Co.	Ansonia, Conn.
B. F. Goodrich Co.	Akron, Ohio
Marion Steam Shovel Co.	Marion, Ohio
A. O. Smith Corp.	Milwaukee, Wis.
Waukesha Motor Co.	Waukesha, Wis.
Youngstown Sheet and Tube Co.	Youngstown, Ohio

In standard Straightway, 3-Way and 4-Way styles, NOPAK Valves (no packing) made from ¼" to 2" pipe openings. Write for bulletin.

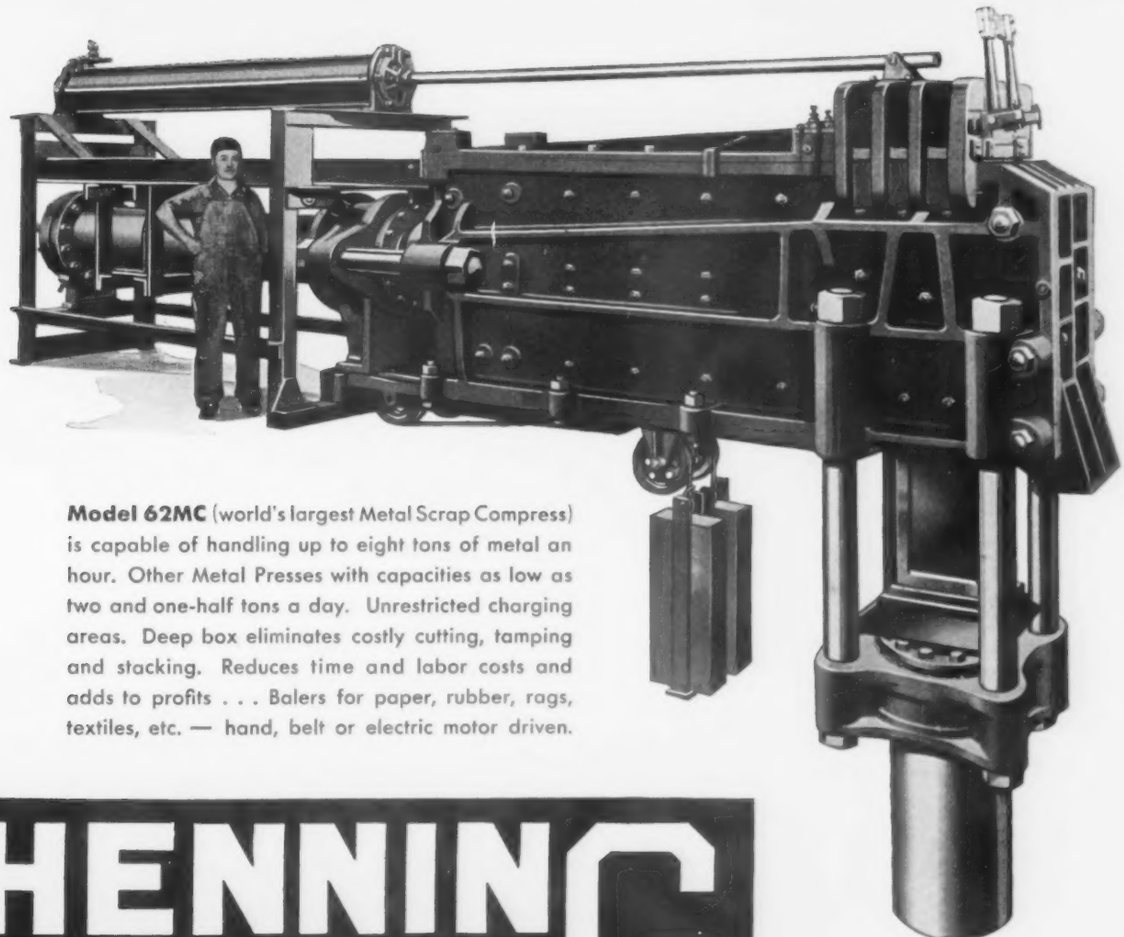
1931— a year of planned economies. Wise industrial management recognizes profits or savings in all manner of scrap or waste properly baled—paper, rubber, rags, textiles and metals. Turn to Galland-Henning for the finest Baling Equipment to organize scrap heap losses into Bales of Profit.

Galland-Henning Balers are powerful, simple, speedy, economical — exclusive features assure full capacities, better bales, easy, safe handling. Whatever the material or quantity, we have a machine engineered to the job. Guaranteed right by forty-one years of industrial successes.

Tell us your scrap problems. Expert recommendations for profitable scrap handling available at no obligation. Write for facts.

GALLAND-
MANUFACTURING
2743 South 31st Street

ERS
into BALES OF PROFIT!



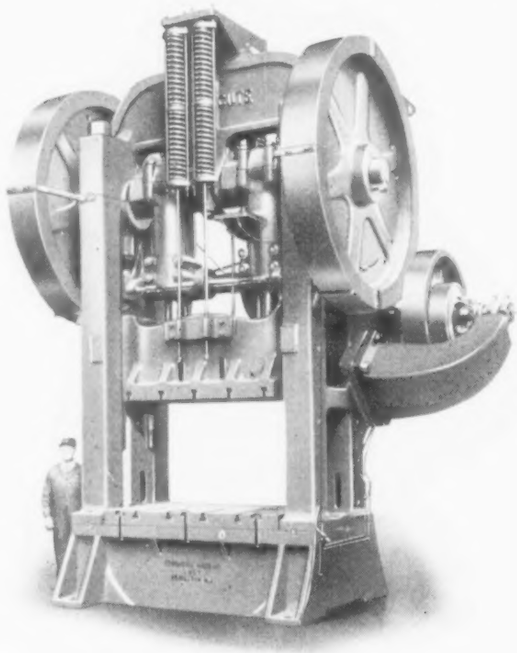
Model 62MC (world's largest Metal Scrap Compress) is capable of handling up to eight tons of metal an hour. Other Metal Presses with capacities as low as two and one-half tons a day. Unrestricted charging areas. Deep box eliminates costly cutting, tamping and stacking. Reduces time and labor costs and adds to profits . . . Balers for paper, rubber, rags, textiles, etc. — hand, belt or electric motor driven.

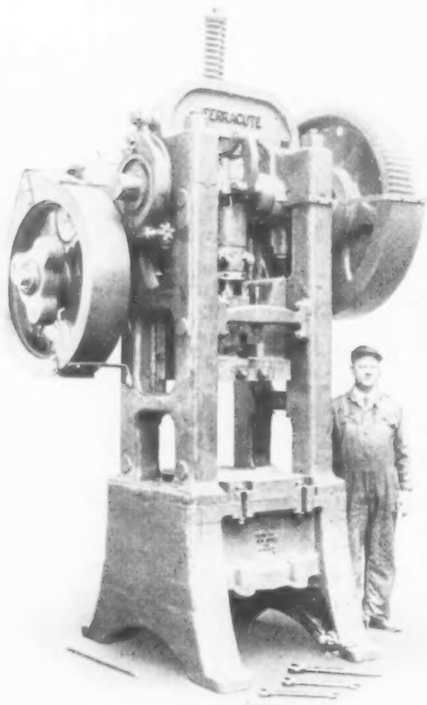
HENNING COMPANY
Milwaukee, Wisconsin

FERRACUTE PRESSES

Reduce Costs Increase Production

THE cut at the right shows a FERRACUTE double crank, double and twin geared press S-652. It exerts 650 tons ram pressure and is excellent for heavy blanking, forming or pressing. It is equipped with modern multi disc friction clutch gear guards, and ram balance. It operates easily and accurately. Our catalog 22, Sec. S, will give you details regarding this type of press.





THE press D G 56 shown at the left is a modern single crank, single back geared press of tie rod construction. The ram pressure exerted is 100 tons. This type of press is excellent for deep drawing work and all sorts of punching and blanking work.

For further information regarding straight sided, single crank presses, write for catalog 22, Sec. D.

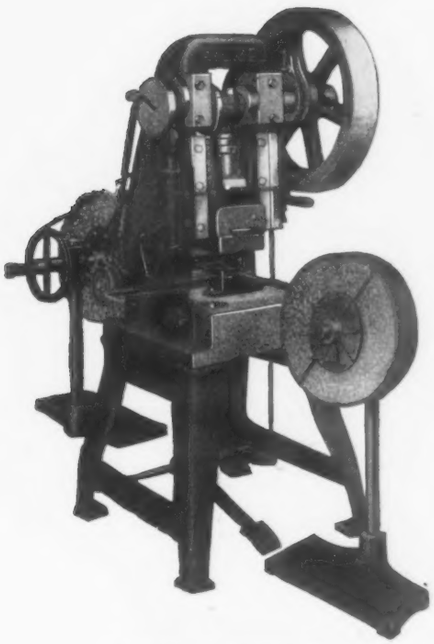
Ferracute Machine Co. has been producing presses since 1863 and will be glad to give you the benefit of the valuable experience gained during all these years.

FERRACUTE MACHINE COMPANY

BRIDGETON, NEW JERSEY

SPECIAL AGENTS:

Chicago: Neff, Kohlbusch & Bissell
Cincinnati: The E. A. Kinsey Co.
Indianapolis: The E. A. Kinsey Co.
Baltimore: Kemp Machinery Co.
Buffalo: Crane-Schieffer-Owens, Inc.
Rochester: Crane-Schieffer-Owens, Inc.
Oakland: Flanagan Machinery Co.
San Francisco: Flanagan Machinery Co.
St. Louis: Wm. C. Johnson & Sons Mch. Co.
New York: Percy M. Brotherhood & Sons.
Syracuse: Crane-Schieffer-Owens, Inc.
Canada: Canadian Fairbanks-Morse Co., Ltd.



Automatic Power Press

Use BAIRD Equipment *for* ECONOMY *and* EFFICIENCY

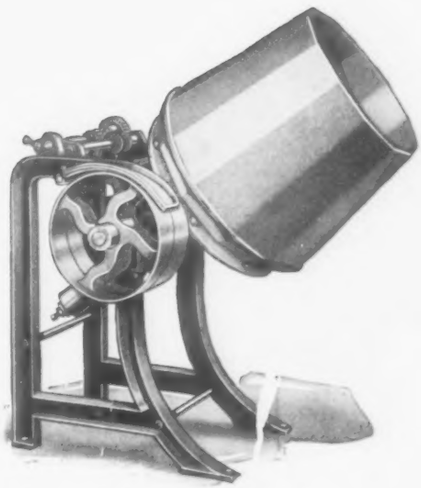
The increasing demands of modern production have stressed the need of equipment to give greater economy and efficiency in the production of small parts.

BAIRD Equipment for producing and finishing these small parts has kept a pace ahead of this growing demand with progressive designs which were built to meet these anticipated requirements.

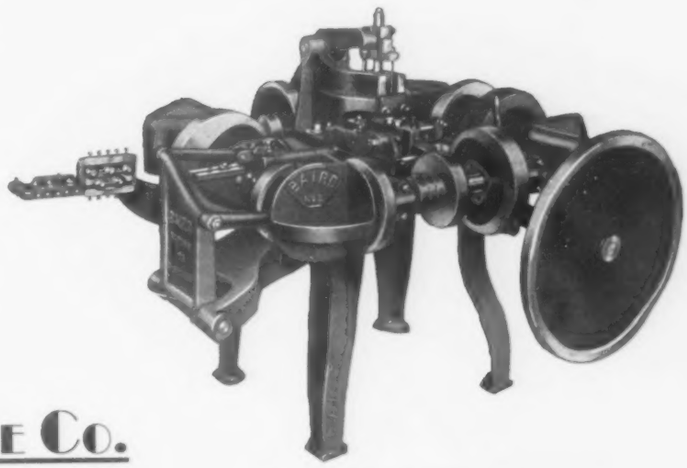
BAIRD Automatic Presses take ribbon stock from coil and feed, pierce, transfer, form, blank and eject entirely automatically—maximum production at minimum cost.

BAIRD Tumbling Barrels for efficient cleaning, drying, polishing, burnishing, etc.—at a very low cost.

BAIRD Four Slide Forming Machines for faster cutting, punching, forming, and marking of small metal parts from wire or ribbon metal.



Tumbling Barrel



Four Slide Forming Machine

THE BAIRD MACHINE CO.
BRIDGEPORT, CONNECTICUT

MINSTER

Minster offers a complete line of fine presses in types and sizes to include every class of sheet metal work.

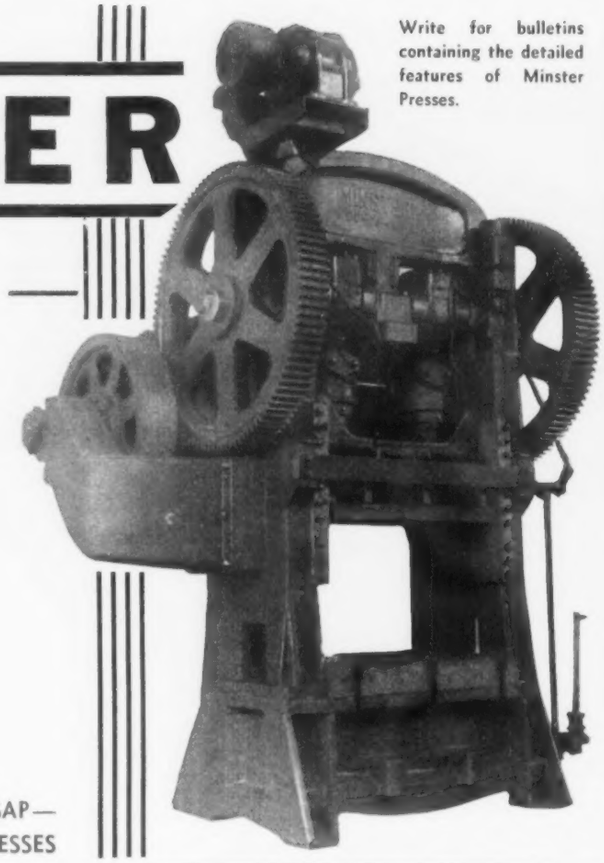
Every Minster Press embodies special features which make it particularly suitable for its intended purpose.

Minster Presses have a most convincing record for satisfactory and economical operation.

THE MINSTER MACHINE CO.
MINSTER, OHIO

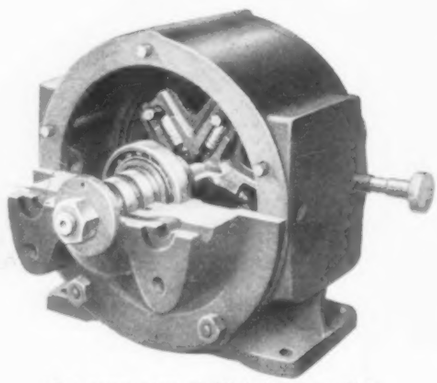
•

INCLINABLE—HORNING—STRAIGHT SIDE—GAP—
KNUCKLE JOINT—PUNCHING AND SCREW PRESSES



Write for bulletins containing the detailed features of Minster Presses.

Hydraulic Smoothness with the HELE-SHAW



Cut away view of High Pressure Hele-Shaw Hydraulic Pump

SURELY, steadily, quietly, with liquid smoothness, Hele-Shaw Hydraulic Pumps go about their work, providing easily controllable power for drives of all kinds.

Without effort, they build up pressure to overcome resistance that would cause gearing to clash and grind, but they do it under such perfect control that no excess pressure ever can be applied to break tools or machines.

The Hele-Shaw Pump operates on a principle of balance. Pressure in the fluid system, automatically controlled, invariably balances the resistance to be overcome up to the limit of the pump's capacity. As a result, operation is continuous, without pulsation, and the Hele-Shaw pump runs at a constant speed, regardless of the pressure or speed at which the machine it drives is operated.

Write for booklet describing the many uses of Hele-Shaw Pumps.

AMERICAN FLUID MOTORS COMPANY
2410 Aramingo Avenue **Philadelphia, Pa.**

MARQUETTE



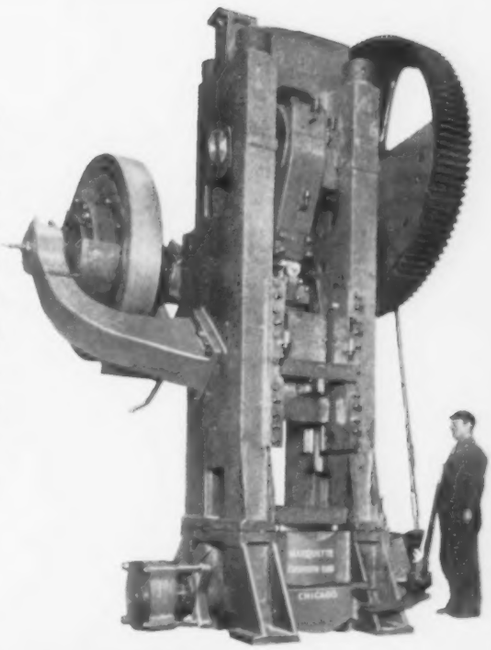
CUSHION PRESS BEDS FOR OVERLOADS

THE MARQUETTE LIFT-OUT will permit the forging to cool properly. Ejects the work without loss of time during press strokes. It can be operated either by hand or automatically.

THE CUSHION BED is an insurance against press breakage. It can be safely set for any desired pressure and yields in case of overloads. It acts automatically. Does not necessitate the attention of the press operator.

Of particular advantage for hot or cold embossing, or coining jobs, where varying heat conditions or differences in thickness of material often cause die and press breakage, the Marquette Cushion Bed will prove an economical investment in your plant.

WRITE FOR PARTICULARS



MARQUETTE TOOL & MFG. CO

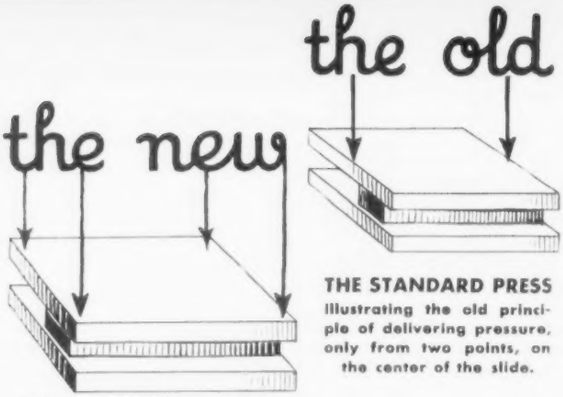
6500 WEST 65TH STREET CHICAGO U.S.A.

METAL STAMPING EQUIPMENT

MARQUETTE

PATENTED

4 POINT SUSPENSION PRESS



THE MARQUETTE 4 POINT SUSPENSION PRESS

Its basic principle — that of preventing the slide and ram from tipping—is a mechanical advantage over the old 2 Point Standard Press. On the new, pressure is delivered from four points.

THE STANDARD PRESS

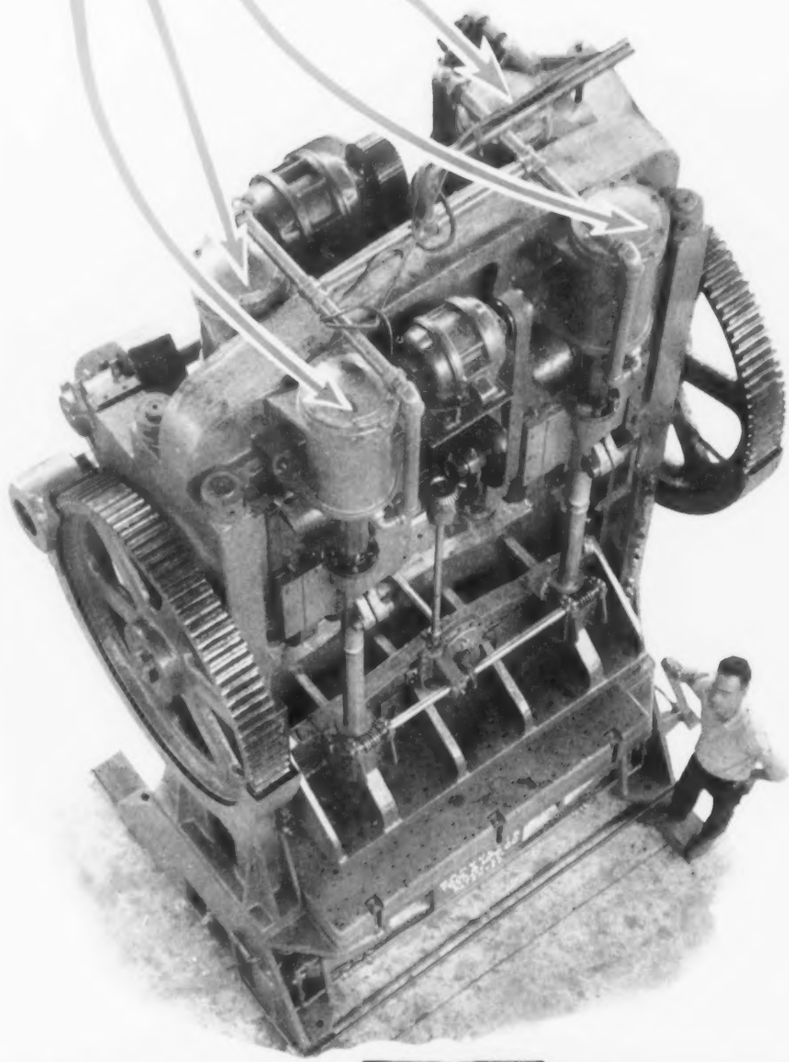
Illustrating the old principle of delivering pressure, only from two points, on the center of the slide.

Whenever the shape of the dies create side-thrusts, or the work is placed off center, the slide of the Marquette 4 Point Suspension Press does not tilt.

ORIGINATED AND BUILT BY MARQUETTE

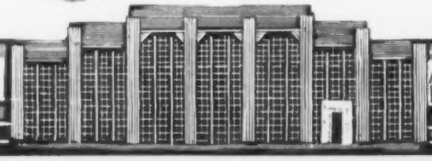
The Marquette Presses can be furnished in all sizes. They can be equipped with **THE MARQUETTE SELF CONTAINED CUSHION BED,** thus eliminating deep pit foundations and tank installations.

LET OUR ENGINEERING DEPARTMENT SOLVE YOUR STAMPING PROBLEMS. MAIL US BLUE PRINTS OR SAMPLES OF YOUR WORK



MARQUETTE TOOL & MFG. Co

6500 WEST 65TH STREET CHICAGO U.S.A.



METAL STAMPING EQUIPMENT

IN POWER PRESS OPERATION

Haphazard Pressures are Obsolete



Fig. 3534—U. S. Patent Numbers
1,653,350
1,672,561
1,711,378
1,746,419
Other patents pending

H·P·M

Here is the press to replace your mechanically operated power presses, which work within space limits and depend on fussy vertical adjustment of dies for safety *and for effective pressure as well.* This press works to a definite predetermined pressure regardless of vertical die adjustment. It delivers a quick squeeze instead of a blow and makes possible better press-work, even with cheaper stock. It lowers press maintenance and die cost. It cuts down tool investment because it is more versatile. Bulletin 30-A-1 tells what you want to know about HYDRO-POWER Presses. Write for it.

THE HYDRAULIC PRESS MFG. CO.
20 East Broad.....Columbus, Ohio
220 Broadway.....New York City

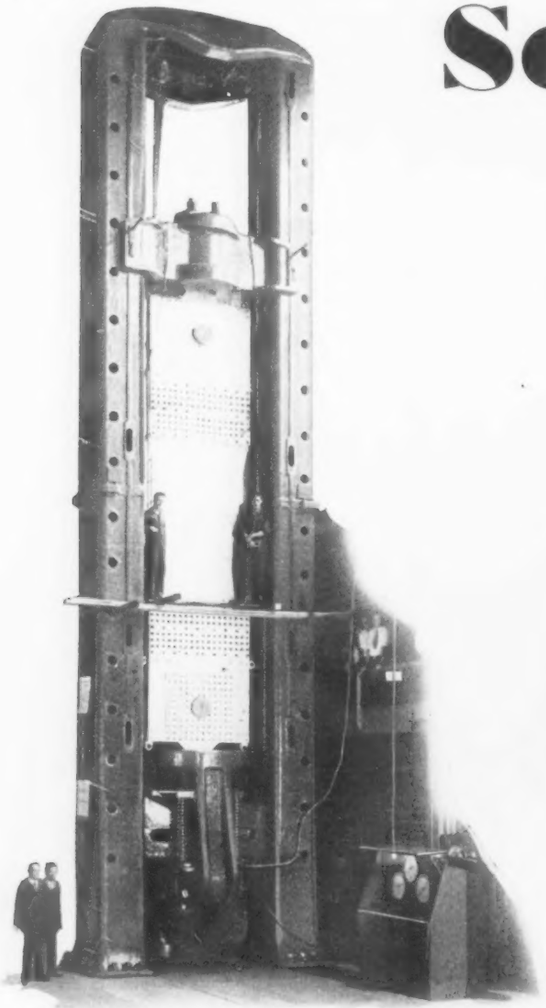
PLANT
MOUNT GILEAD, OHIO
(Suburban to Columbus)

© 1931, T.H.P.M. Co.

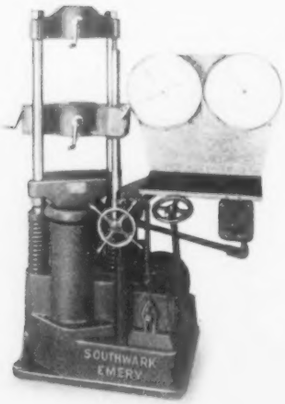
TRADE MARK **HYDRO-POWER** REG. U.S. PAT. OFF.

SOUTHWARK

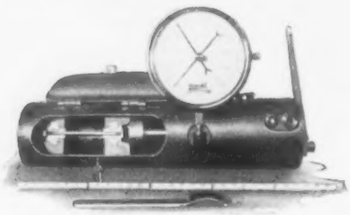
Southwark engineers have contributed many outstanding developments to the advancement and achievements of modern industries. They have simplified difficult operations with faster and more economical production, by supplanting slower methods with modern equipment best adapted to a particular phase of the work.



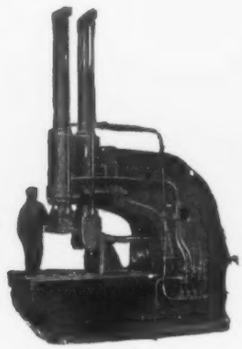
SOUTHWARK-EMERY
UNIVERSAL TESTING MACHINE—CAP. 3,000,000 LBS.



SOUTHWARK-EMERY
UNIVERSAL TESTING
MACHINE
CAPACITY 60,000 POUNDS



PORTABLE TENSILE
TESTING MACHINE



HYDRAULIC
SECTIONAL
FLANGING
PRESS

WE DESIGN AND BUILD

HYDRAULIC EQUIPMENT * POWER TOOLS * ALL TYPES OF MACHINERY FOR SPECIAL APPLICATIONS. COMPLETE MANUFACTURING FACILITIES FOR HANDLING CONTRACTS COVERING PLATE FABRICATING AND HEAVY MACHINE WORK.

SOUTHWARK
FOUNDRY AND MACHINE CO.
ESTABLISHED 1838
PHILADELPHIA, PA.

TESTING EQUIPMENT
SPECIAL MACHINERY

Grey Iron—Steel—Alloy
Castings

AKRON, OHIO
UNITED BLDG.



OUR NEW LOCATION AT EDDYSTONE, PA.

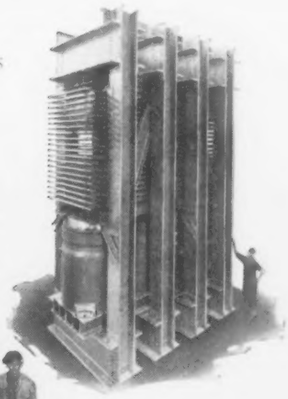
EQUIPMENT

Southwark engineers are skilled in the application of direct hydraulic pressure or in combination with power mechanism, to suit individual operations. Designers and builders of Special Machinery, Hydraulic Presses and Testing Equipment for every application. When you have a special problem, consult Southwark.



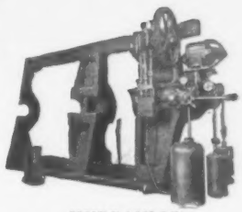
SOUTHWARK LEAD COVERING PRESS
FOR LEAD CABLE COVERING—RUBBER HOSE CURING

4' x 12'
WALL AND
INSULATING
BOARD PRESS





2000 TON
GRINDING
WHEEL PRESS



HYDRAULIC
WHEEL PRESS

SOUTHWARK
FOUNDRY AND MACHINE CO.
ESTABLISHED 1836
PHILADELPHIA, PA.

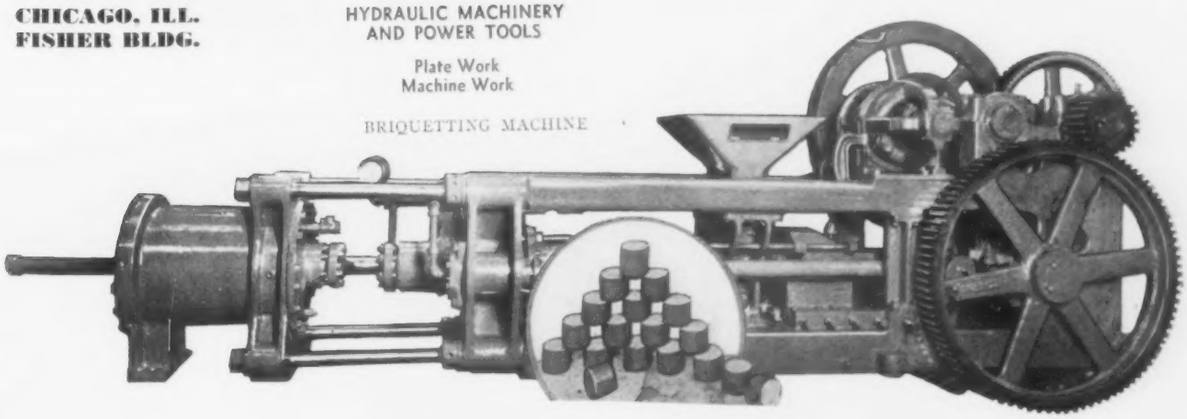
CHICAGO, ILL.
FISHER BLDG.

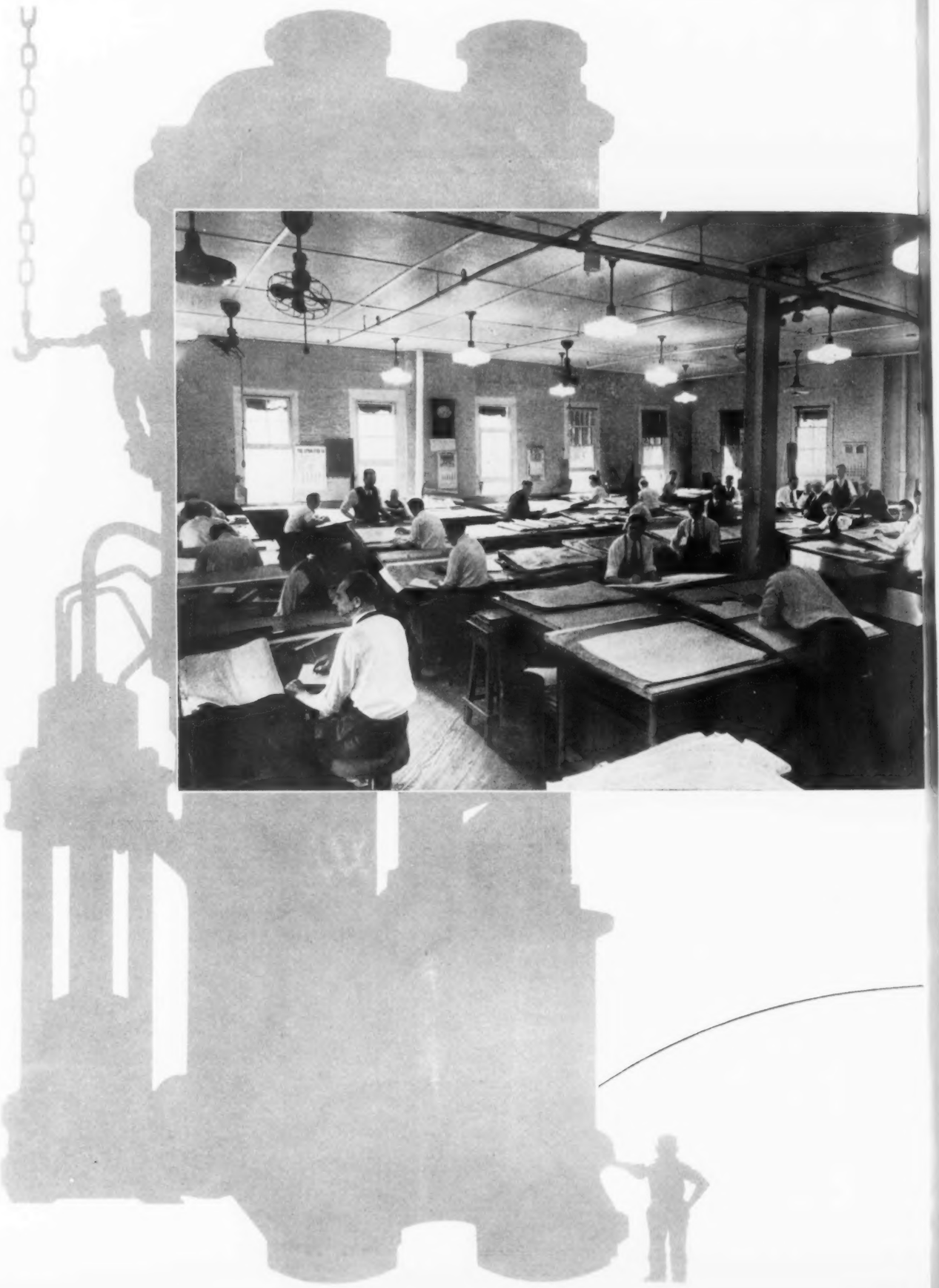
WE DESIGN AND BUILD
MATERIALS TESTING EQUIPMENT COVERING INDUSTRIAL * LABORATORY AND FIELD USE. EMBRACES TENSION * COMPRESSION * HARDNESS * FATIGUE * DAMPING * STRESS INTENSITY, DEFORMATION AND DISTRIBUTION.

HYDRAULIC MACHINERY
AND POWER TOOLS

Plate Work
Machine Work

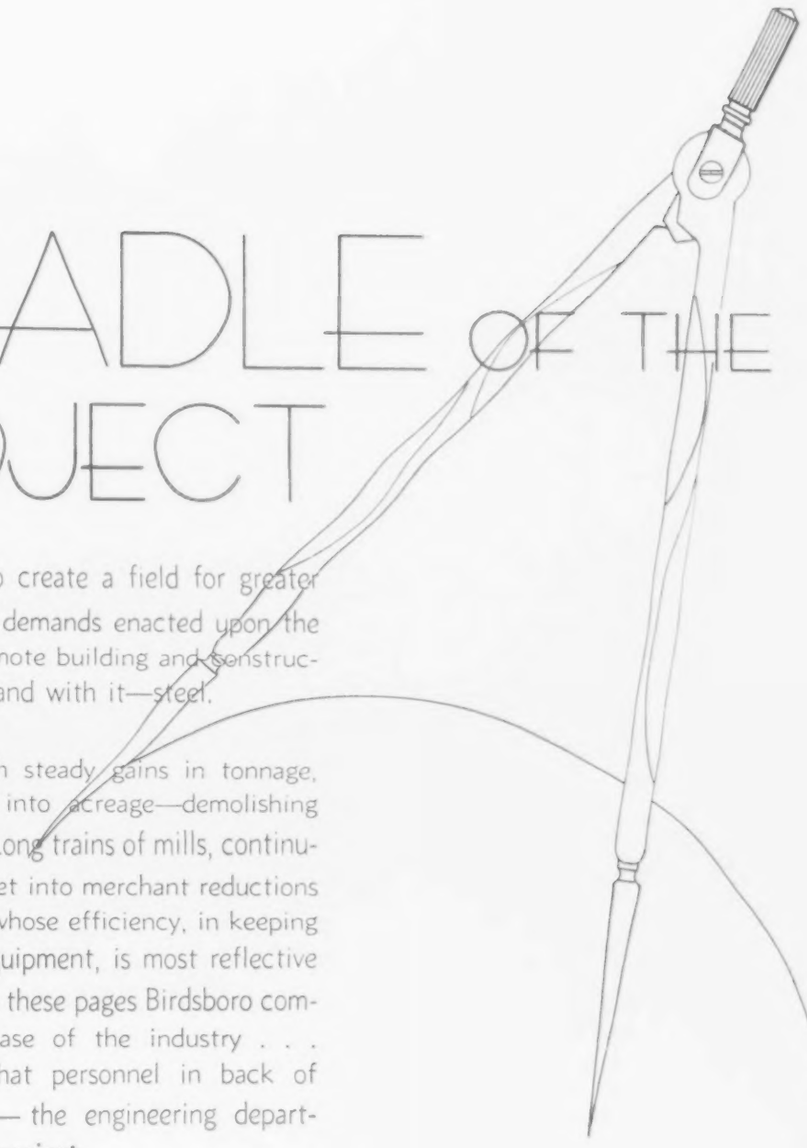
BRIQUETTING MACHINE







THE CRADLE OF THE PROJECT



Progress steps in to create a field for greater commodities. Heavy demands enacted upon the parcels tend to promote building and construction programs . . . and with it—steel.

To keep apace with steady gains in tonnage, steel mills expand into acreage—demolishing old for the new . . . Long trains of mills, continuous, bring heavy billet into merchant reductions over table and bed whose efficiency, in keeping with surrounding equipment, is most reflective of **design** . And to these pages Birdsboro commemorates that phase of the industry . . . a recognition to that personnel in back of every development — the engineering department, **cradle of the project.**

(Illustrated pictorially through courtesy of our own drafting room)

BIRDSBORO
STEEL FOUNDRY AND MACHINE COMPANY
DESIGNERS AND BUILDERS
BIRDSBORO, PENNSYLVANIA

POWER

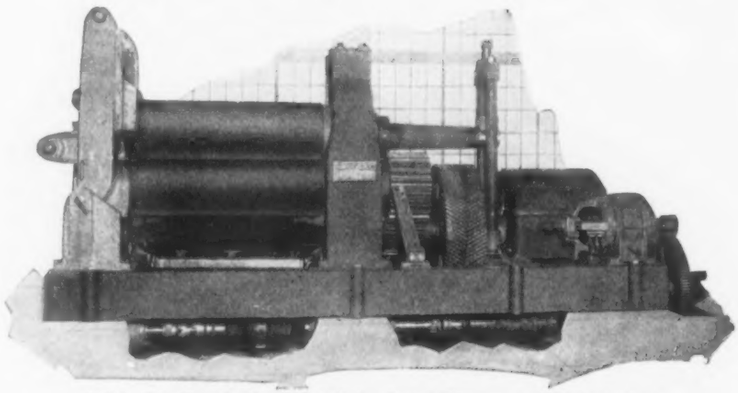
Proof of Ability to Build Dependable Machinery

FOR more than fifty years we have built special machinery for the foremost industries in this country. That this machinery has been dependable and efficient is demonstrated by our ever increasing number of satisfied customers. Here we illustrate for you a few of the recent machines we have built, offering visual evidence of our ability to build dependable machinery for you, NOW.

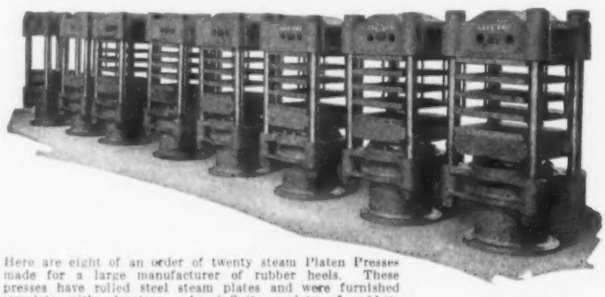
Your inquiries solicited

WE DESIGN AND BUILD

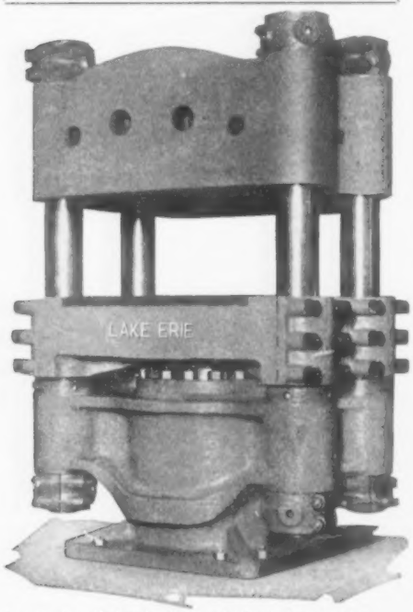
Hydraulic Presses and Accumulators	Bending Rolls
Valves and Fittings	Plate Planers
Plate Working Machinery	Rolled Steel Steam Plates
Special Machinery	Railroad Scale Test Cars
Punches and Shears	Sugar Machinery



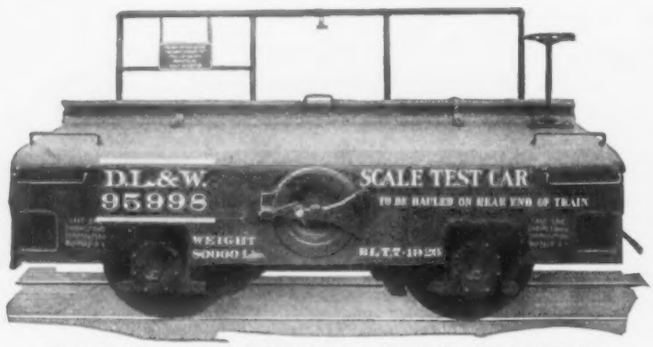
A Lake Erie Plate Bending Roll built for General Electric to roll 48 inch motor frames of 3 inch plate. Note the excellent method by which the housing end is dropped to permit the expeditious removing of completed cylinders.



Here are eight of an order of twenty steam Platen Presses made for a large manufacturer of rubber heels. These presses have rolled steel steam plates and were furnished complete with elevators. An infinite variety of rubber, vulcanized and plastic goods is made on Lake Erie presses.



A 940 ton Hydraulic Press, designed for pressing abrasive grinding wheel products. A Lake Erie Hydraulic Press can be built in any tonnage necessary to meet your requirements.



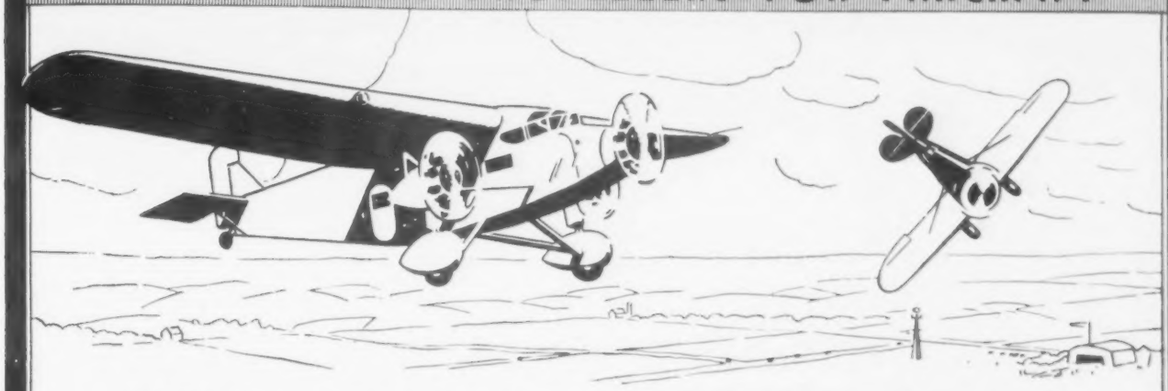
One of the many 80,000 lb. Scale Test Cars we have built. This car is built in accordance with A. R. A. standards, and has a special spotting device which is a great saver of time and expense.

LAKE ERIE ENGINEERING CORPORATION

BUFFALO 270 PERRY ST. **NEW YORK**

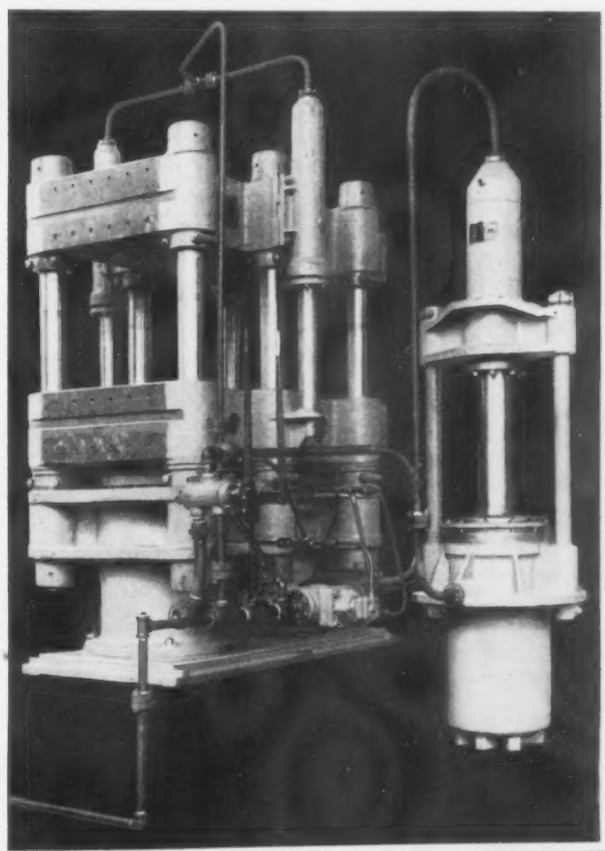
LEE CORP.

THIS 1000-TON HYDRAULIC FORMING PRESS MAKES METAL PROPELLERS FOR AIRCRAFT



ADDED to the hundreds of heavy manufacturing problems met and solved successfully by the engineers of R. D. Wood & Company, was that of designing and building a 1000-ton hydraulic forming press for making metal propellers for aircraft.

For more than a century and a quarter this company has been a leader in conceiving ideas, designing and building hydraulic and other types of machinery to improve manufacturing processes—to lower cost of production—and to assist manufacturers in keeping step with the demand for greater efficiency, safety and reliability of method and product.



What are *your* problems? You are invited to consult the engineering staff of

R. D. WOOD & COMPANY

PHILADELPHIA

ENGINEERS—IRON FOUNDERS—MACHINISTS

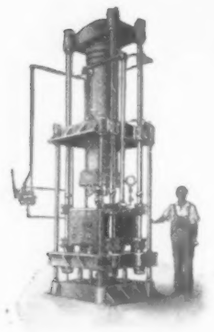
In business continuously since 1803

Designers and Builders of

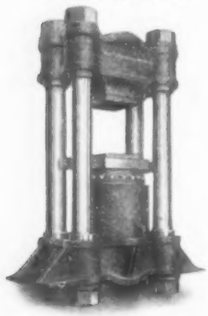
Hydraulic Machinery—Automatic Gas Producers—Gas Washers—General Machinery of every Description

Cast Iron Pipe—SAND-SPUN (Centrifugally Cast) and Pit Cast—Mathews Fire Hydrants—Gate Valves

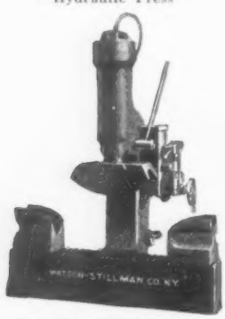
THERE IS NO SUBSTITUTE FOR EXPERIENCE



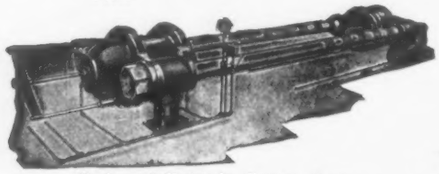
Hydraulic Press for making Saggers, etc.



1000 Ton Die Hydraulic Press



Portable Self Contained Pipe Bending Hydraulic Press



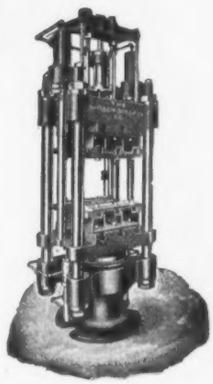
Horizontal Hydraulic Forcing Press

Over 80 Years of constant research has developed the Watson-Stillman line. This long experience is your protection against experiment and untried design.

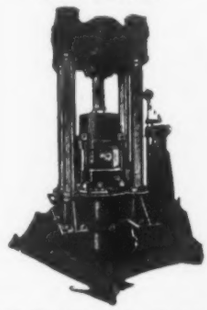
In the final analysis, it is experience you buy in any product whatsoever. Make sure that you get your money's worth when you purchase hydraulic machinery.

We build complete hydraulic plants including pipe, valves, pumps, accumulators, intensifiers, and presses, for every purpose such as:

Asbestos Products	Rubber Works
Automobile Plants	Fibre Goods
Brass and Copper Works	Rubber Hose Man'f'gs
Ceramics and Tile	Machine Shops
Chemical Plants	Jeweler Man'f'gs
Cork and Linoleum	Oil Refineries
Die Sinking	Pulp Mills
Extrusion Processes	Pressed Steel Plants
Forge Shops	R. R. Shops
Foundries	Powder Mills
Food Products	Rayon Man'f'gs
Plastic Moulding	Ship Builders



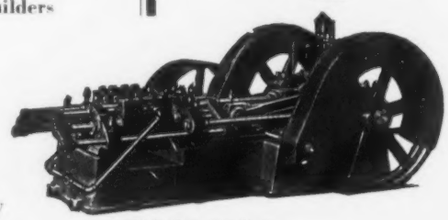
Moulding Press for Plastic Materials



Lead Press for the Manufacture of Electrical Cable and Rubber Hose



Multiple Plate Heating Press



High Pressure Pump

Send for Literature

SALES OFFICES

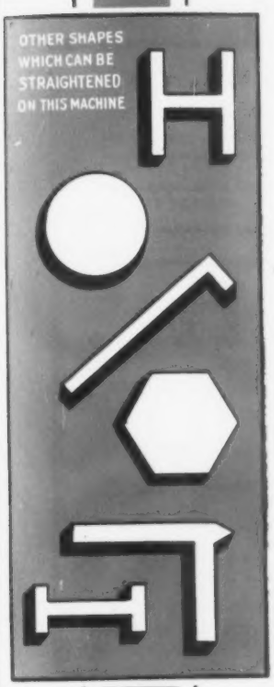
71 West St., New York City

Chicago—228 N. LaSalle St.
Philadelphia—Widener Bldg.
Cleveland—2501 W. Third St.
Detroit—6565 Russell St.
Pittsburgh—Union Trust Bldg.
St. Louis—705 Olive St.
Richmond—1039 Mutual Bldg.
Houston—Union Natl. Bank Bldg.
Atlanta—Forsyth Bldg.

WATSON-STILLMAN HYDRAULIC MACHINERY

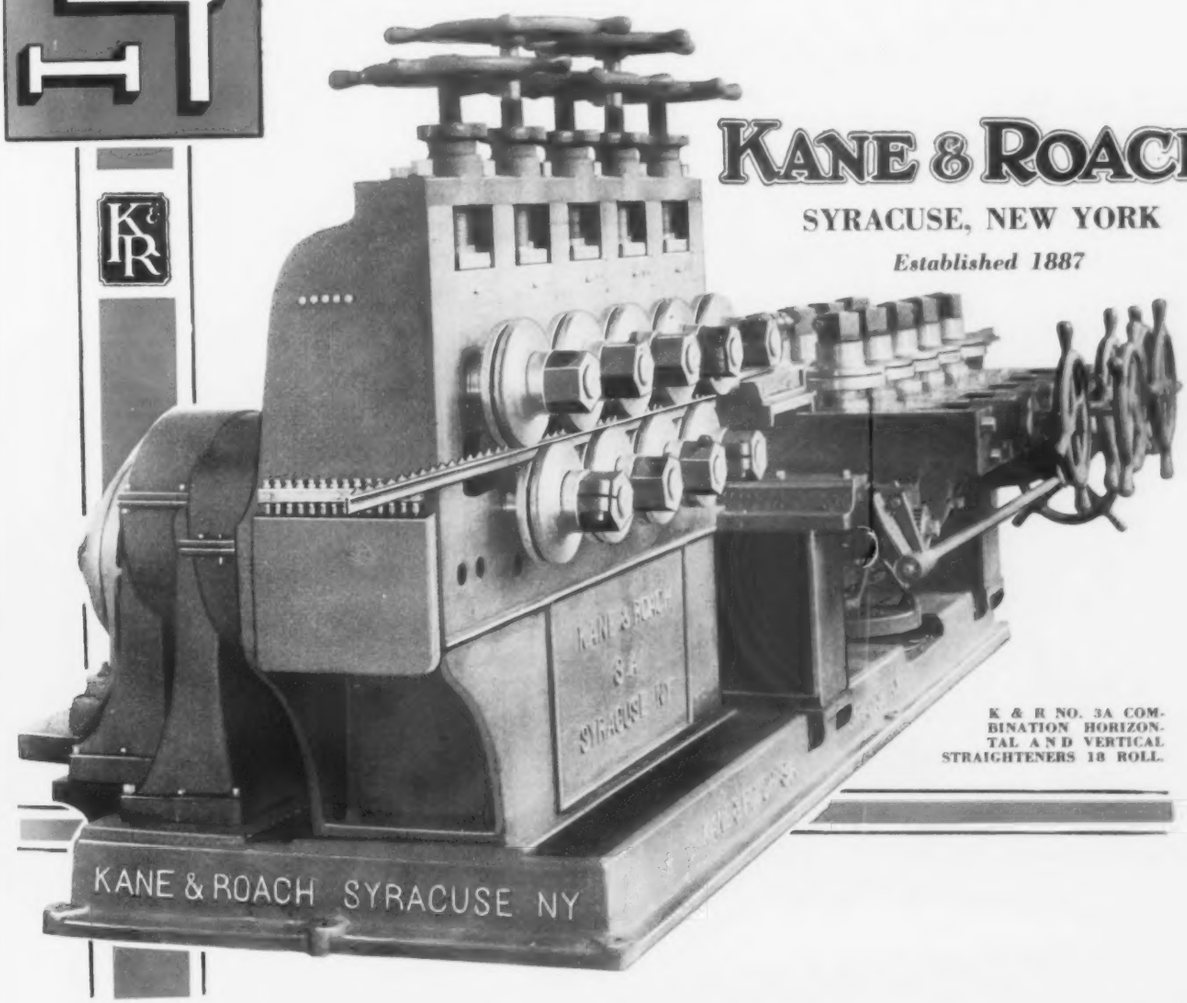
STRAIGHTENING 300
Feet Per Minute at The Inland Steel Plant

OTHER SHAPES WHICH CAN BE STRAIGHTENED ON THIS MACHINE



Mr. H. H. Straus, Vice President of the Inland Steel Company, says, "The Vertical and Horizontal Straightener furnished us is proving most satisfactory for the straightening of tee steel. We will be pleased to recommend its use to anyone desiring information."

That is the rate K & R Straightening Rolls deliver straightened high carbon Tee steel fence posts for the Inland Steel Co. They have ordered their third unit within a year. These rolls are the latest design—built to meet the present-day demands for higher speed and lower costs, in steel mills and fabricating plants, for straightening angles, channels, rounds, squares, flats, etc. When K & R Straightening Rolls are once installed, they soon become standard equipment. Built in many sizes.



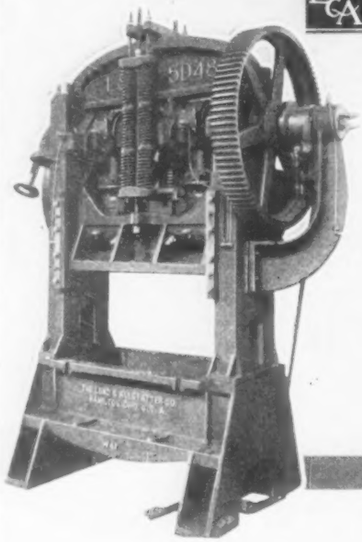
K & R NO. 3A COMBINATION HORIZONTAL AND VERTICAL STRAIGHTENERS 18 ROLL.

KANE & ROACH

SYRACUSE, NEW YORK

Established 1887

L&A STRAIGHT SIDE TIE ROD PRESS



Single geared with direct motor drive through gearing with silent motor pinion. Self-adjusting brake. Clutch made of .75 carbon steel—four striking surfaces.

The LONG & ALLSTATTER CO.
Hamilton, Ohio, U. S. A.

FRENCH HYDRAULIC MACHINERY
PIQUA OHIO

RICHARD DUDGEON, INC.
HYDRAULIC MACHINERY
JACKS, CAR PROPELLERS, PUMPS, PRESSES, PUNCHES
FILTER PRESS JACKS AND ROLLER TUBE EXPA NDERS
ESTABLISHED 1850
BROOME & COLUMBIA STREET
NEW YORK CITY

..SMITH..

Unbreakable Steel Plate Frame
Punching and Shearing Machines
. . . cut costs, boost profits

Bending Machines for rolling Angles, Beams, Channels, etc.
. . . famous for accurate work

David H. Smith & Sons, Inc.
Representatives in All Principal Cities of U. S. A. and Canada
Foot of 51st St. . . . . Brooklyn, N. Y.

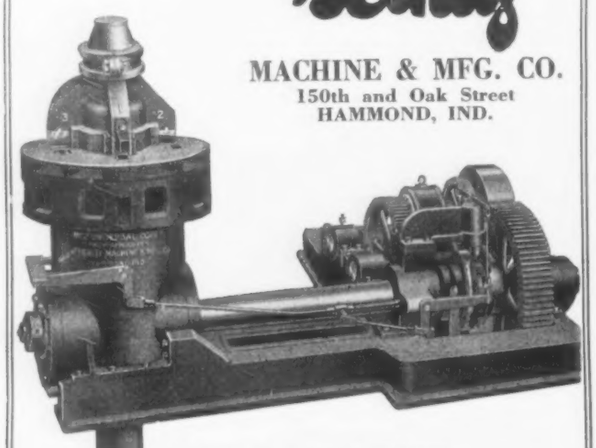
The Beatty 4 in 1 Coping Machine is a Super-efficient tool!

This Beatty Machine has the advantages of a revolving turret head with four Coping Cutters, which permits cutting flanges and webs from 3" to 24" I Beams without tool change.

By pressing a lever, the operator brings to the front of machine, the size cutter suitable for the work at hand. On long work the head can be turned to suit cut, eliminating expense of turning material.

Write for complete specifications

Beatty
MACHINE & MFG. CO.
150th and Oak Street
HAMMOND, IND.



BEATTY—4 IN 1—COPING MACHINE
FOR HANDLING 3 to 24" I-BEAMS—AND 2 to 18" CHANNELS
AND OUT-BACK ON ALL SIZES WITHIN ABOVE RANGE

QUICKWORK



ROTARY SHEARS
—cut square and beveled edges in straight or irregular shapes, cut and flange circles, joggle, etc. One "QUICKWORK" replaces several old standard machines and does work they will not do. Made in many sizes for all gauges up to 1".

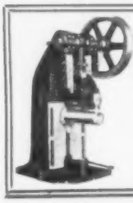
Write for Catalog No. 90

THE QUICKWORK COMPANY
(NOT INCORPORATED—H. COLLIER SMITH, OWNER)
ST. MARY'S OHIO, U. S. A.
Cable Address: "QUICKWORK." All standard codes used.

MILWAUKEE
ALLIGATOR SHEARS
Milwaukee ALL STEEL Shears will *outcut* and *outlast* any other alligator shear. They are made by BUILDERS OF ALLIGATOR SHEARS ONLY—FOR 30 YEARS.



DOELGER & KIRSTEN
3105 Chambers Street, Milwaukee, Wis.



Robinson Sheet Metal Working Machinery

Inclinable Presses	Gap Presses
Double Crank Presses	Squaring Shears
Horning Presses	Gap Shears
Toggle Presses	Corrugating Machines

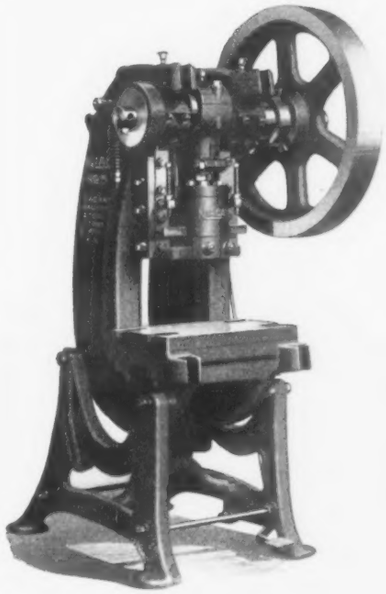
Hand and Power Brakes

NEW ALBANY MACHINE MFG. CO.
Sole Owners J. M. Robinson Mfg. Co.
NEW ALBANY, IND.

SOLVING PRODUCTION PROBLEMS IN SHEET METAL WORK

NIAGARA

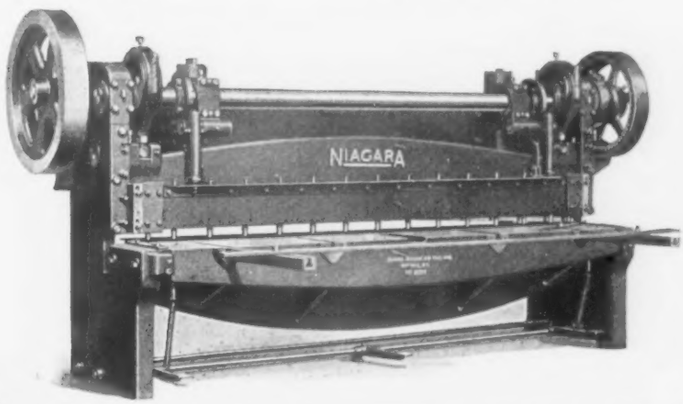
MACHINES - TOOLS - DIES

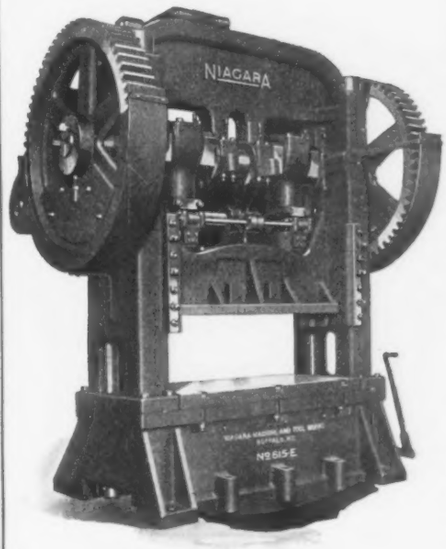


CLOSER accuracy and increased output at lower cost is the rule with products by Niagara, whose business for over 50 years has been the designing and building of machines and tools for working sheet metal. You will find that true machine tool design sets its mark on every Niagara machine. Write for the bulletins that interest you . . . and allow our engineers to assist you in selecting the right machine for the job at hand.

POWER PRESSES AND PUNCHES

No. 58—Inclinable Open Back Presses.
No. 59—Power Bench Press.
No. 60—Power Horn Presses and Side Seamers.
No. 61—Power Punching Presses.
No. 62—Power Arch Presses and Open Back, Gap Presses.
No. 63—Straight Side Single Crank Power Presses and Trimming Presses.
No. 64—Double Crank Power Presses (Built-up Frame).
No. 65—Double Crank Power Presses (One-piece Frame).
No. 66—Toggle and Cam Presses.
No. 67—Power Punches, Single, Multiple, etc.
No. 68—Foot Operated Presses.





POWER SQUARING SHEARS

No. 71—Power Squaring Shears (Light Gauge).
No. 72—Power Squaring Shears (Medium Gauge).
No. 73—Power Squaring Shears (Heavy Gauge).

POWER ROTARY SHEARS

No. 70—Circle Shears.
No. 70—Ring Shears.
No. 70—Power Flangers.

SHEET METAL SHOP MACHINES AND TOOLS

Handy Reference Catalog No. 56 describes the smaller machines and tools for the sheet metal shop.

SPECIAL EQUIPMENTS—ENGINEERING SERVICE

We make special machines and arrangements of our regular and special machines for the manufacture of many sheet metal products. Allow our skilled engineers to assist in solving your problems.

DIES AND FEEDS

Through unusual experience, facilities and organization, we can furnish dies and feeds of real excellence at a reasonable cost.

NIAGARA MACHINE & TOOL WORKS

637-697 Northland Ave. Buffalo, N. Y.

NEW YORK CITY 50 Church St. | PHILADELPHIA Elverson Bldg. | PITTSBURGH Park Bldg. | DETROIT General Motors Bldg.

STAMCO

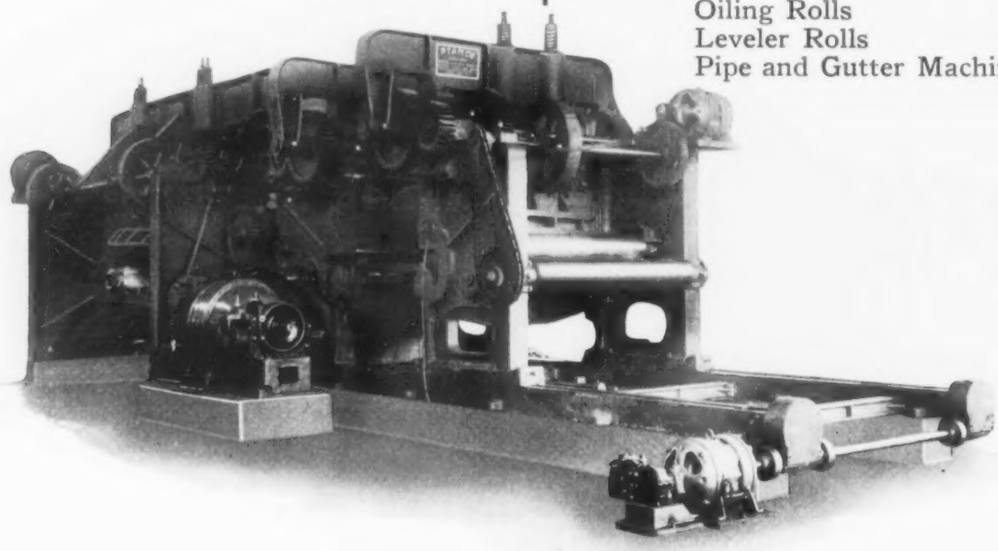
SHEET & PLATE MACHINERY

SOME OF THE USERS OF OUR
CONTINUOUS SHEET PACK SHEARS

American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bethlehem Steel Co.
Follansbee Brothers Co.
Gulf States Steel Co.
Illinois Zinc Co.
Inland Steel Co.
Michigan Steel Co.
Newton Steel Co.
Newport Rolling Mill Co.
Otis Steel Co.
Rome Copper Co.
Republic Steel Corp.
Tennessee Coal, Iron & R. R. Co.

OTHER PRODUCTS

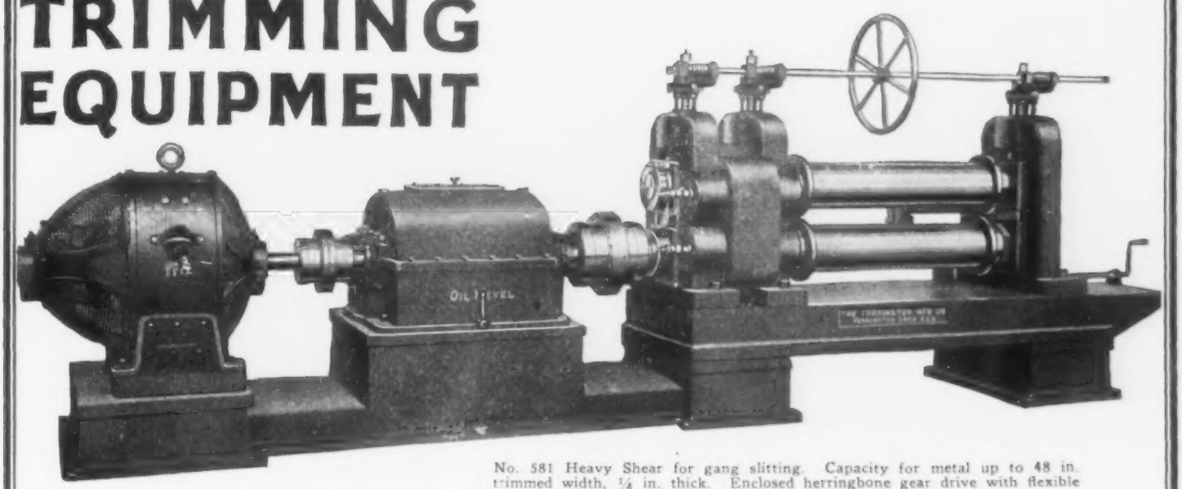
Automatic Shears
Continuous Shears
Tinplate Pack Shears
Sheet Pack Shears
Plate Shears
Jobbing Mill Shears
Power Squaring Shears
Power Gap Shears
Nonferrous Sheet Shears
Rotary Gang Slitters
Corrugating Rolls
Culvert Machinery
Corrugating Presses
Forming and Roofing Presses
Crimping Rolls
Roofing Machinery
Paint Rolls
Oiling Rolls
Leveler Rolls
Pipe and Gutter Machines



Continuous Sheet and Pack Shears

THE STREINE TOOL & MFG. CO.
NEW BREMEN, OHIO

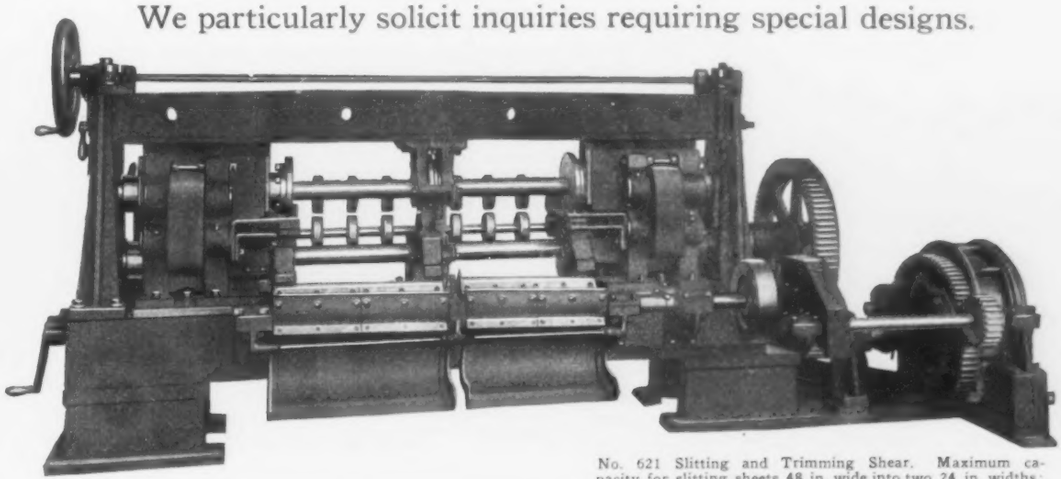
METAL SLITTING AND TRIMMING EQUIPMENT



No. 581 Heavy Shear for gang slitting. Capacity for metal up to 48 in. trimmed width, ¼ in. thick. Enclosed herringbone gear drive with flexible couplings.

Specialists for thirty-five years in the building of slitting and trimming machines in a wide range of sizes with all auxiliary equipment, including winders, coilers, scrap cutters, etc.

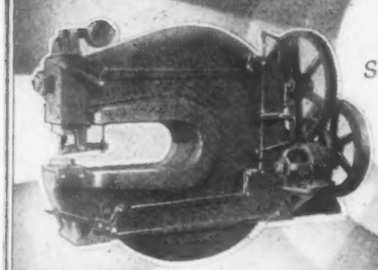
We particularly solicit inquiries requiring special designs.



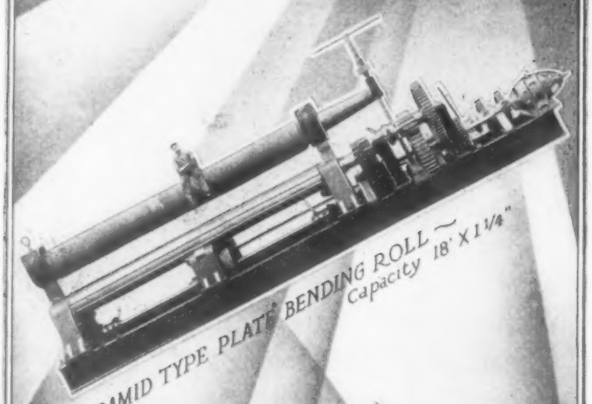
No. 621 Slitting and Trimming Shear. Maximum capacity for slitting sheets 48 in. wide into two 24 in. widths; or minimum 8 in. sheets into two 4 in. sheets. Can a'so be used as a trimmer. Equipped with scrap cutter. Cutters quickly adjustable for different widths of metal.

The Torrington Mfg. Co.
Torrington - Conn, U.S.A.
44 Franklin St.

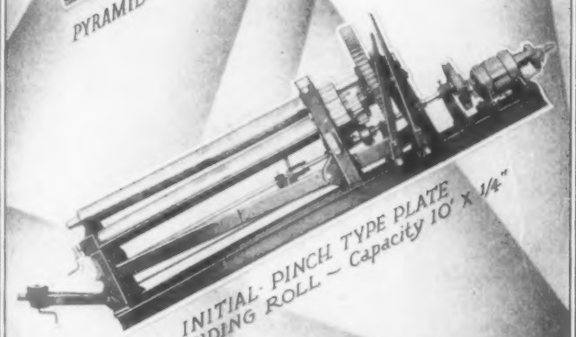
Capacities:
Lightest sheet metal to heaviest plate



SINGLE END PUNCH and SHEAR

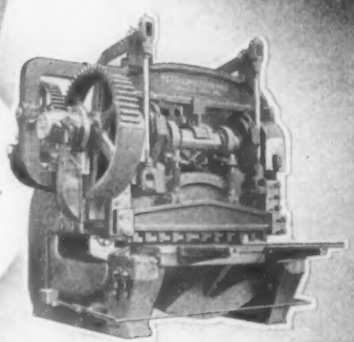


PYRAMID TYPE PLATE BENDING ROLL — Capacity 18' X 1¼"



INITIAL PINCH TYPE PLATE BENDING ROLL — Capacity 10' X 1¼"

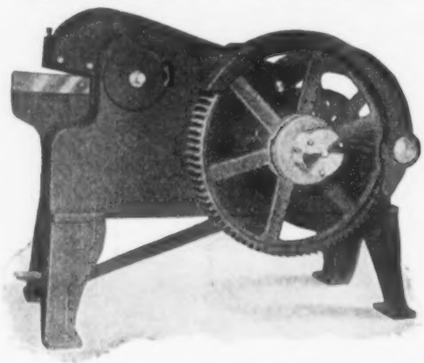
Our Line
includes machines for all classes of sheet metal, plate and structural work



HEAVY GATE SHEAR

BERTSCH & CO.
Cambridge City Indiana

BELOIT
Punches, Shears
and
BENDING ROLLS



Beloit Alligator Shear

This sturdy compact Shear has a single piece main frame casting. It is designed throughout for maximum service with minimum cost. It is easy to operate and maintain, and amply back geared to require a minimum amount of power.
Built in five sizes with a maximum capacity of 2½ in. rounds, 1 in. x 8 in. for flats.

Send for catalogue.

Hendley & Whittemore Co.
Blackhawk Blvd., Beloit, Wisconsin

No. 7 Roller Bearing Punch — No. 12 Ball Bearing Punch



Capacity ¼" thru ⅛"
Weight 6½ lbs.
Made in 3 Sizes, Nos. 7, 7½ and 8.



Capacity ⅜" thru ¼"
Weight 11 lbs.

Be sure the letter



is on all your Punches and Dies
They are made in Our Own Factory and Are Genuine
Write for Catalog and Price List on Entire Line

WHITNEY METAL TOOL COMPANY
100 FORBES STREET ROCKFORD, ILL.

R. S. NEWBOLD & SON COMPANY

Straightening & Levelers — Shears
Mill Tables — Pipe & Tube Bending & Cutting Machinery
Washer Punches — Contract & Special Machine Work
Tanks — Stacks — Fabricated Plate Work

53 PARK PLACE, NEW YORK CITY
140 WASHINGTON ST., NORRISTOWN, PENNSYLVANIA
JENKINS ARCADE BLDG., PITTSBURGH, PA.



1 of 21 Sizes and Types of Hand and Motor Operated *Cold Pipe* Bending Machines we make bending ⅛" to 8" Pipe.

Cost of Bending: 1"—3 cents 3"—20 cents 6"—60 cents
2"—5 cents 4"—40 cents 8"—$1.00

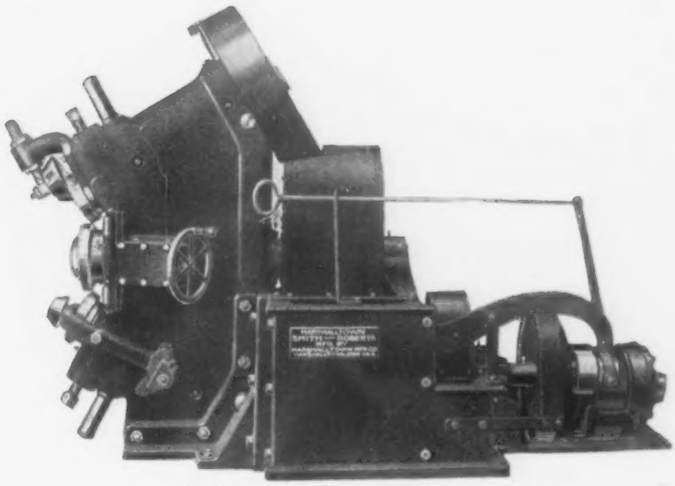
Over 8,000 in use. Send for catalog.
Pipe Threading and Cutting Machines ⅛" to 16".

AMERICAN PIPE BENDING MACHINE CO., Inc.
31 Pearl Street, Boston, Mass.

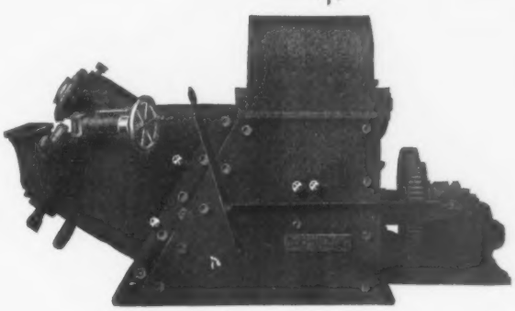
By Using

MARSHALLTOWN THROATLESS SHEARS

THE MARSHALLTOWN LINE



Double Rotary Bevel Shear No. 234



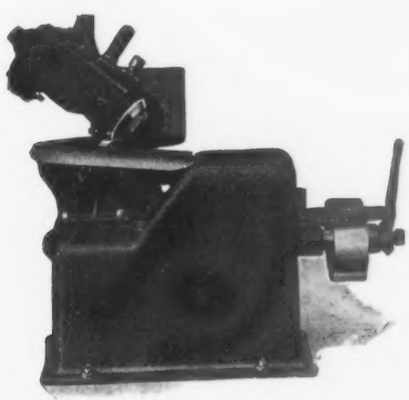
Inverted Bevel Shear

.....*You Save Time, Labor and Money*

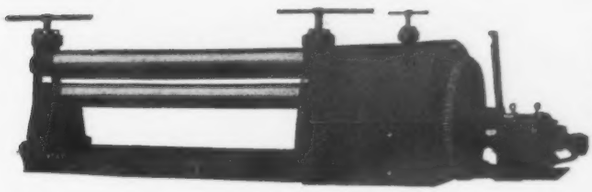
The throatless feature of Marshalltown permits fast cutting of sheets and plates, regardless of size. And in addition, you can cut curves, straight or irregular shapes—cut curves of small radius in any direction, from material of a half-inch and under.

Self-feeding and easy to operate—the corrugated cutter feeds the material automatically. The work is finished as it leaves the machine. No buckling or stretching of material.

We test every machine thoroughly before it leaves our shop, and back it with a guarantee against defective material and workmanship.

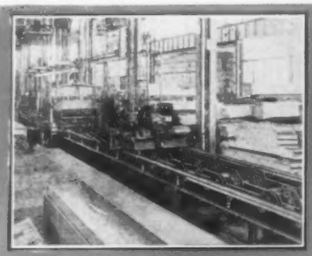


Throatless Shear No. 112



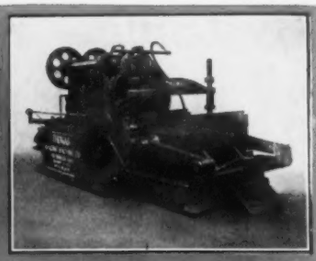
Bending Rolls

MARSHALLTOWN MANUFACTURING CO.
MARSHALLTOWN, IOWA.



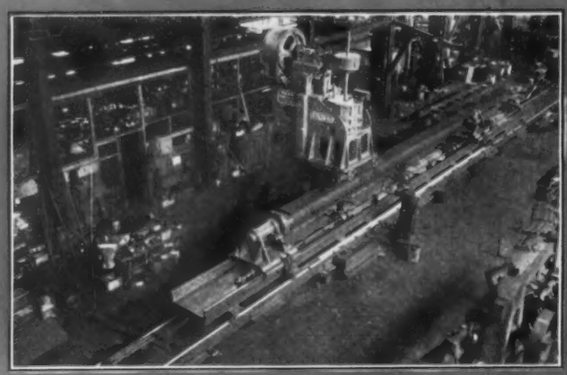
Thomas Multiple Punch and Automatic Spacing Table.

THOMAS



The Thomas Column Facing Machine.

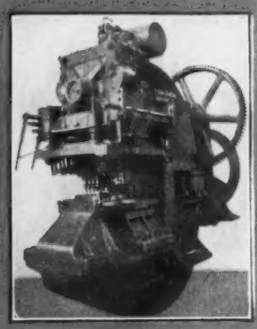
THE SIGN OF LOWERED PRODUCTION COSTS



A thirty-two spindle Thomas Drill with Roll-Over Drill Table.



An exceptionally large Multiple Punch with double line of tools.

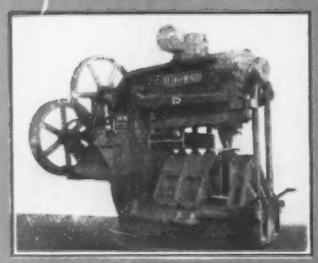


Thomas Beam Type Punch.

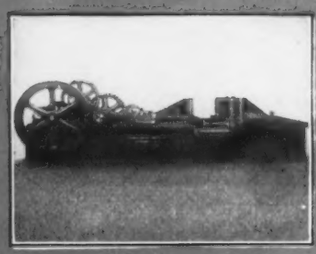
To design *no* machine that is not an improvement over existing equipment has always been the aim of Thomas.

To build *no* machine in which is not the best of workmanship and materials has always been the rule of Thomas.

Thus has the Thomas name plate on Fabricating Machinery become known as the mark of lowered fabricating costs.



The Thomas Super Punch with double pintles.

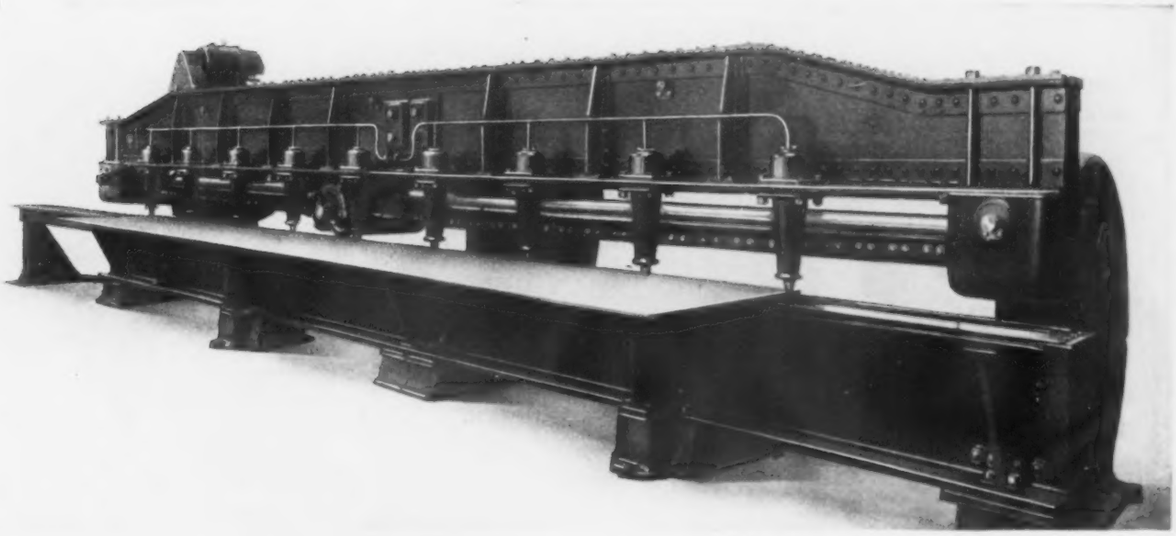


An all steel frame Bending and Straightening Machine built by Thomas.

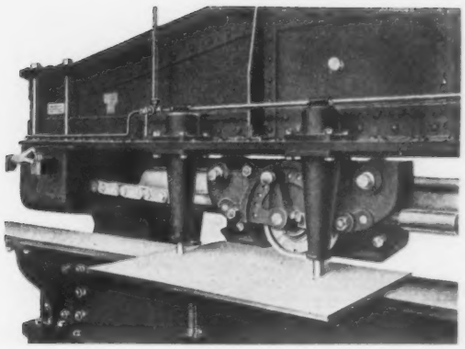
THOMAS

SPACING MACHINE COMPANY

CHICAGO PITTSBURGH PHILADELPHIA



SN Plate Shear, Model DB-20
Capacity ¾" x 240"



Close-up of Knife Carriage, Pneumatic Hold-down and Push Button Control

UNITED MACHINE TOOL CORPORATION NEW YORK

NEW SN PLATE SHEAR

for Modern High Speed Shearing

Plate-slitting, Trimming, Beveling, Scarfing

FEATURES

No engaging mechanism.

Motor actuates rotary upper knife direct.

Travel of upper knife can be stopped instantly at any point of stroke—making blocking out of plates an added feature.

Plates lie flat and are held fast (by pneumatic jacks) while cutting.

Change from square to bevel cutting accomplished in 2 minutes.

Model DB-20 illustrated above, will meet practically all modern plate shearing requirements. It has a capacity up to ¾" x 240" plate—also built to take cuts 1¼" x 50' at one stroke—true cuts guaranteed to within a tolerance of 1/32 inch—clean cut surface of beads comparable to those made on a planer while cutting at 20 times the speed.

Rolled steel top and bottom and cast steel housings, rigidly assembled with a heavy forged steel guide shaft—guaranteed unbreakable. *Write for catalog No. 3 containing full information on this revolutionary shear.*

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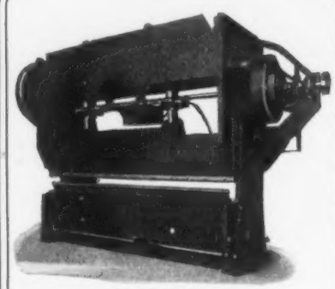
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STEEL BENDING BRAKES AND FORMING PRESSES

The perfected result of over 30 years experience in the manufacture of sheet metal bending machines. Over 25,000 machines in use.



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Cornice Brakes
Power Brakes
Box and Pan Brakes
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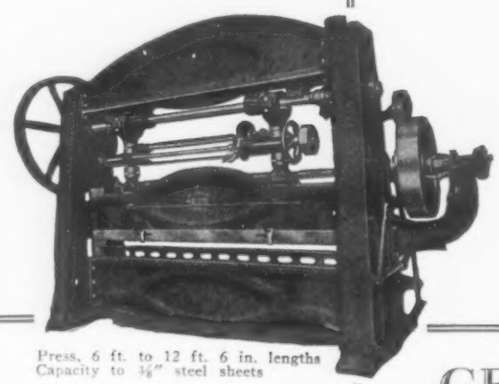


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The most complete and up-to-date line of sheet and plate bending and forming machines in the world. Lengths, 3 to 16 feet, with capacity to bend from the lightest metals up to ¾ in. plate, cold.

DREIS & KRUMP MANUFACTURING CO.
Loomis Street · Chicago

HERE'S ≈ *What you can do on this OHL-10 Ft. Power Brake*



Press, 6 ft. to 12 ft. 6 in. lengths
Capacity to ⅜" steel sheets

—Bend a ten-foot sheet of No. 10 gauge steel—or, form skylight bars of No. 26 gauge steel in two operations. The seven members are bent in one operation and the bar squeezed together in the next.

This OHL Power Brake is equipped with a new method of holding dies, is amply proportioned, and heavily constructed, and includes a patented friction gear.

We'll be glad to go over this machine with you point for point and explain how economical—and simple—it is to operate.

GEORGE A. OHL & CO., Inc.
Originators of Sheet Metal Working Machinery Since 1863
151-161 Oraton St. **Newark, N. J.**

Crimping and Hammering Machines — Slitting Shears—Power Presses.

Double Cam Brakes—Slip Roll Formers—Squaring Shears—Mitre Cutters—

COLD ROLLING MILL MACHINERY

For Any Metal

Steel, Brass, Copper, Tin, Aluminum, Gold, Silver, Etc.

Also a full line of auxiliary machines such as Slitters, Circular Shears, Straightening and Cutting-off Machines, Automatic Pickling Machines, Scrap Bundlers, etc.

JUNKER WATER-COOLED MOULDS

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REPRESENTING
SCHMITZ & CO.—FABRIQUE DE LAMINOIRS THOUNE

The HOSSFELD UNIVERSAL IRON BENDER "WRENCHLESS TYPE"

Patented in the U.S. and Canada

Bends Pipe, Bars and Angle Iron



Let the Hossfeld Bender Solve Your Bending Problems

No other Bender on the market like it.

This Powerful, Steel Constructed, Wrenchless, Universal, Pipe, Bar and Angle Iron Bender, will neatly, quickly and accurately turn out most any kind of a bending job that ever comes up, either in maintenance or production work — such as Eye Bolts, "U" shapes, "S" shapes, Links, Circles, Offsets, Braces, Cranks, etc. It will also roll eyes on flat stock for Automobile Springs and the like.

It does a perfect job on Pipe work, bending to any degree or to a continuous coil without flattening it or splitting the seam.

The bending of Angle Iron is an exceptionally wonderful feature of the machine. It forms a smooth perfect curve or circle of any radius desired, without twisting or distorting the stock in the least. It also bends Sharp Square bends on notched Angle Iron.

The machine is built in two sizes. The larger size bending up to 2-inch standard pipe, 4½-inch flat bar stock, or 2x2x5/16-inch angle iron, cold. There are thousands of these machines in use by all classes of trade in the U. S., Canada and other foreign countries.

Write for descriptive literature and prices.

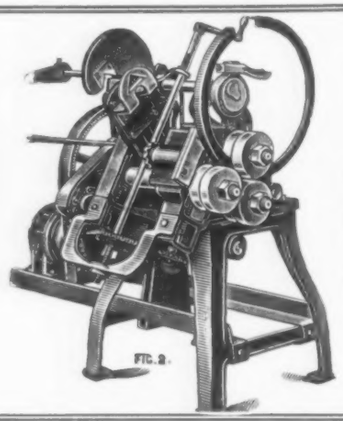


Samples of Bar Bending *Samples of Pipe Bending*

MANUFACTURED ONLY BY

Hossfeld Manufacturing Co

WINONA, MINN.



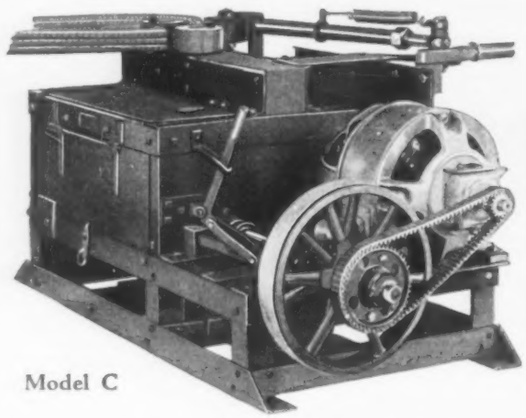
CIRCULAR ANGLE
BENDING MACHINE No. 14

Capacity up to 2 in. Angle Iron 10 in. to 10 ft. circles
With or without cut-off attachment; belt or motor driven.

True circles can be formed on this Machine free from twist.
We are designing a Machine to bend into circles, U or S shape, 4" x 4" angle iron or under.
Your inquiries solicited.
Also manufacturers of Automatic Grinding and Polishing Machines, Crushers, Pulverizers, Power Shears, Presses, Punches, Brakes, etc.

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Model C

THE KARDONG CIRCLE (*Silent Chain Drive*) BENDER

Circles of any size required in reinforcing work from 18" in diameter up can be made on this bender. Changes of radius can be made in the same circle, without stopping machine with lever adjustment. Where speed and large capacity are required this machine will give unfailing satisfaction. It is the right machine for the fabricator having a heavy tonnage of reinforcing circles. As high as five one-half inch Bars can be bent in one operation.

Ask for catalogue of our complete line of reinforcing steel benders.

KARDONG BROTHERS, Inc.
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Cuts clean

Clean cuts in steel are economical cuts They show that there has been no loss of time in the cutting operation, and no waste of cutting gases.

Whether it is in sheet steel or armorplate, the Purox "E" Cutting Torch, illustrated, gives a cut that is smooth and clean. It is the favorite among operators who demand quick, economical cutting. The reason is that the "E" Cutting Torch is "Metal Master" equipment, built according to Purox standards of precision in workmanship and quality in material.



Purox "E" Cutting Torch
"It will weld too"

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General Offices: Carbide and Carbon Building, New York

The jobber nearest you will gladly show you the Purox line

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VARIOUS TYPES AND SIZES
FOR ALL RIVETING PURPOSES
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WELDING AND CUTTING EQUIPMENT
Outfits, Torches and Automatic Acetylene Generators
The Imperial Brass Mfg. Co., 1210 W. Harrison St., Chicago

YOU NEED Federal EQUIPMENT FOR

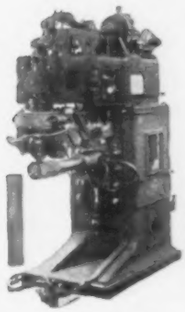
SPOT or PROJECTION



Federal Senior No. 2

You will be attracted by the new Federal Senior No. 2 Spot or Projection Welder. For flexibility, reliability and efficiency at high speed production, and continuous service it has no peer, yet it is moderate in price. You cannot afford to buy a spot or projection welder without first finding out about the new Federal Senior.

SEAM or LINE

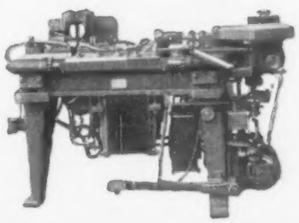


Federal Seam or Line Welder

For all types of straight or circular seaming on cans, drums, flat, or corrugated surfaces standard Federal Seam Welders have been perfected. Speeds from 5 to 30' per minute and in throat depths from 12 to 48" with transformers ranging from 15 to 150 KW.

Welding

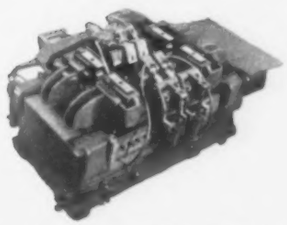
BUTT or FLASH



Federal Automatic Butt or Flash Welder

Federal Butt and Flash Welders cover a range in cross section from No. 26 wire up to 30 sq. in. These equipments have been designed with Federal exclusive features such as Flashproof transformers and bearings. Some have air clamping others hydraulic or hand with mechanical upset, hydraulic and hand toggle, which allows the application of the most practical design to your production.

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Federal Tube and Pipe Welders

Federal Tube Welders cover a range from 1¼" to 6" in diameter. They are used for safe ending locomotive boiler flues and superheater tubes, likewise for coils subjected to 500 lbs. pressure. Federal Pipe Welders weld ranges from 2" to 8" in one machine and 4" to 16". These equipments are used for double lengthening pipe for oil field construction where 40' lengths are necessary. Let us show you where Federal welders will reduce your present production costs.

THE Federal MACHINE & WELDER CO.

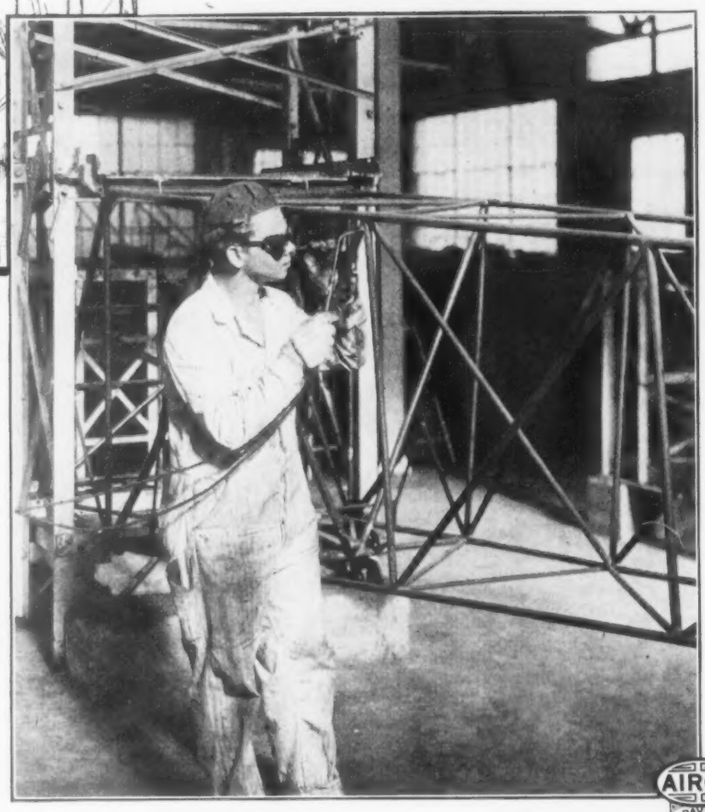
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LIGHTEST TO WELDING



Where dependable maximum strength is required in the lightest possible structure, oxyacetylene welding has proved indispensable.



Have you one or more welders in your plant or shop? If so, you know about the important savings in production processes, maintenance of machinery, salvaging of scrap, etc., that oxyacetylene torches are effecting.

The variety of uses for welding and cutting is increasing steadily throughout the country in thousands of plants, with both hand torches and mechanically operated oxyacetylene machines. Are you taking advantage of all the ways that your equipment can benefit you?

The Airco Engineering Staff is glad to tell Airco customers about new uses and improved methods of using Airco Oxygen, Acetylene and Airco-Davis-Bournonville Apparatus.

Airco Oxygen
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AIR REDUCTION

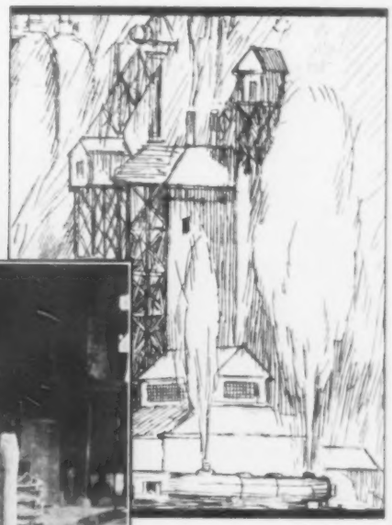
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HEAVIEST AND CUTTING



For cutting the heaviest steel sections, such as 66″ risers, the convenience of oxyacetylene cutting offers indispensable economies.





Airco-Davis-Bournonville Welding and Cutting Apparatus and Supplies

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Or if he is using oxyacetylene welding or cutting in production, he can tell you of speeding up operations or carrying them on at lower cost with better results.

Better yet, write the Airco office in the nearest town listed, what your business is and ask how you can take advantage of the savings that are benefiting others in similar lines.

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SPOT — BUTT—SEAM
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AND SPECIAL TYPES

We maintain a staff of experienced sales engineers and service men in all important industrial districts.

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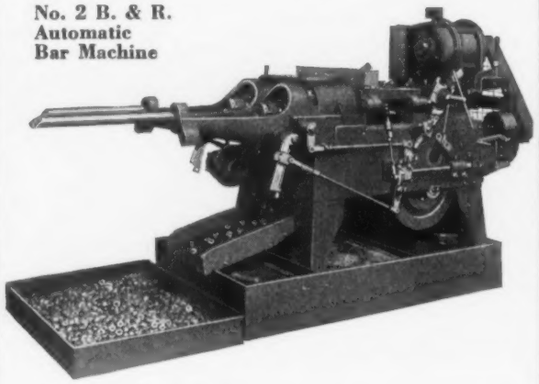
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PORTABLE
TAYLOR-WINFIELD WELDERS
For
labor-saving
lower-cost production
The TAYLOR-WINFIELD CORP., WARREN, O.

COOK CAP SCREW MACHINES
for shaving CAP SCREWS under and over the head in one operation.

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**No. 2 B. & R.
Automatic
Bar Machine**



Profit-Earning Nut-Blank Equipment.
Proven Advantages of B. & R. Automatic Bar Machines for Making Nuts

More Nuts from given weight of stock used.
Higher Grade of Product.
More Production per spindle per hour.
Repeat orders verify these claims.

These machines are built in four sizes, covering range of nut sizes from ¼" to 2" U. S. Std. Will handle either cold-drawn or hot-rolled bar stock.

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True economy in welding

Once the initial cost of the welding machine has been written off, the principal cost items of a welding job are labor and welding wire.

In most cases, the cost of the welding wire is insignificant compared with the cost of labor. Yet the strength and dependability of the welds largely hinge on the quality of the deposited metal.

Since welding wire plays such an important part in the production of good welds—but represents a very small part of total welding cost—is there real economy in using anything but the best welding wire, particularly when the best costs so little more?

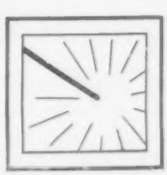
Thousands of plants and utilities—including the country's foremost manufacturers and railroads—attest to the economy and superiority of Roebling Welding Wire. We invite you to test it and we'll gladly furnish samples. Made in various analyses, in both gas and electric types.



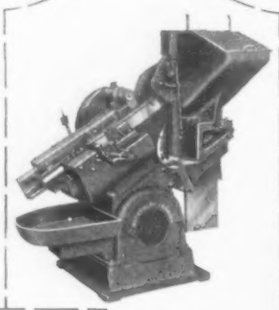
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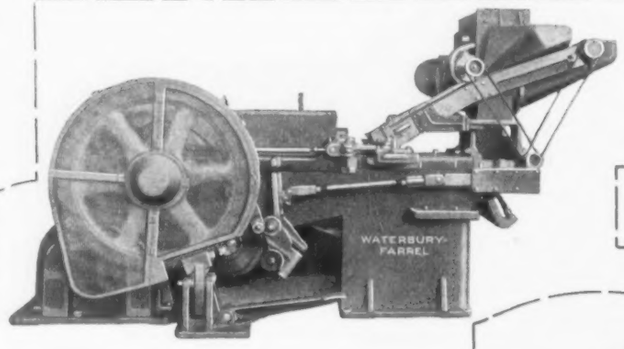
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ROEBLING  WELDING WIRE

WATERBURY-FARREL



⅜" automatic screw threader. 75 per min.



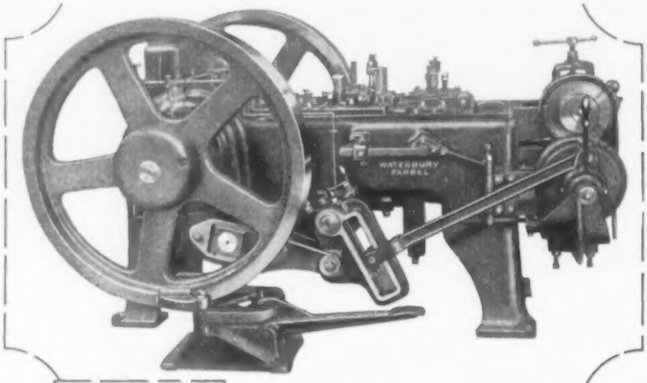
¾" bolt head trimmer. 65 per min. (max.)



AUTOMATIC COLD PROCESS BOLT & NUT MACHINES

3/16" screw slotter. 125 per min. for brass.

SINGLE, DOUBLE AND TRIPLE STROKE HEADERS, BOTH OPEN and SOLID DIE TYPES; BALL HEADERS; SINGLE AND DOUBLE-END SPOKE AND ROD HEADERS; ETC.



⅜" double stroke open die header. 70 per minute.

BOLT HEAD TRIMMERS; SCREW HEAD SLOTTERS; SCREW THREAD ROLLERS; NUT MACHINES; SPECIAL RIVET MACHINERY; ETC.

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WIRE STRAIGHTENING

and

CUTTING MACHINE

with

FLYING SHEAR



The first Hallden Wire Straightening and Cutting Machine has been in continuous operation nearly five years, and many others over four years—and still going strong.

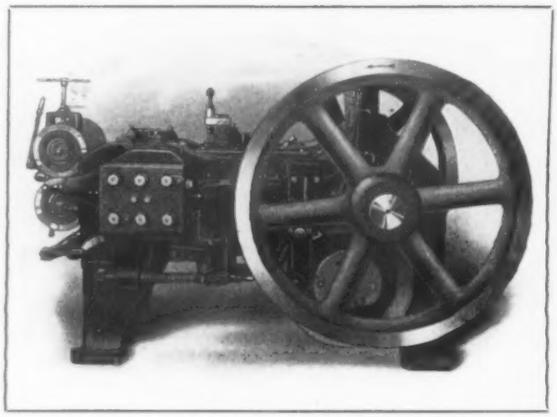
A Hallden will solve your wire straightening and cutting problems and bring you a good return on your investment—a fact proved by the large number of repeat orders from satisfied users.

Write for full details.

***The* HALLDEN MACHINE CO.**

THOMASTON. CONN.

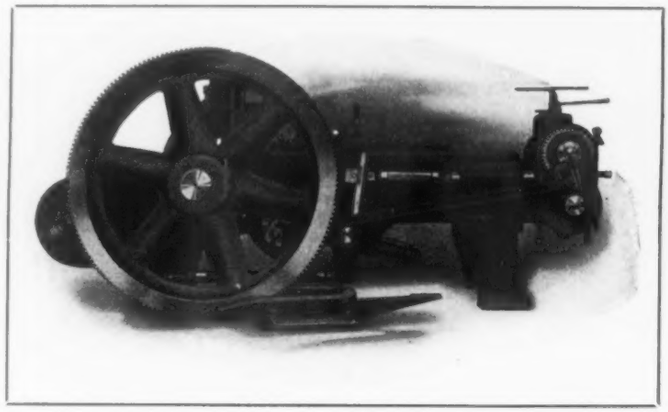
MANVILLE



MANVILLE NO. 312 C.S.O.D. COLD HEADER
5/16" x 4" CAPACITY

COLD FORGING SPECIALISTS

Single, Double And Triple Stroke Headers, For All Kinds Of Cold Upsets. A Complete Range Of Sizes Up to 1" Dia. Wire



MANVILLE NO. 750 C.S.S.D. COLD HEADER
¾" x 5" CAPACITY

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BOLT TRIMMERS
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BRASS, COPPER AND ALL ALLOYS

SHAPES

SUCH AS HEXAGONS, SQUARES, FLATS, ETC.

HOT ROLLED STOCK

We have motor driven types, belt driven types, rotary types, roll types, etc.

Capacity is unusual, Accuracy is absolute, Maintenance very low, and Durability Remarkable.

Put your problems up to us, and we will show you how you can reduce your costs.

Easy to operate, or adjust . . . in fact, in many Plants one unskilled laborer operates a battery of

"SHUSTERS"

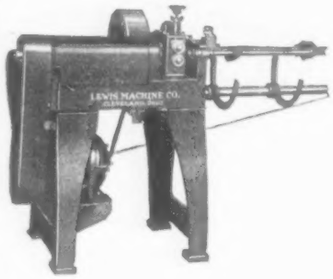
Straightener Specialists Since 1866

Catalogue 30 for the asking

THE F. B. SHUSTER COMPANY, NEW HAVEN, CONN.

LEWIS

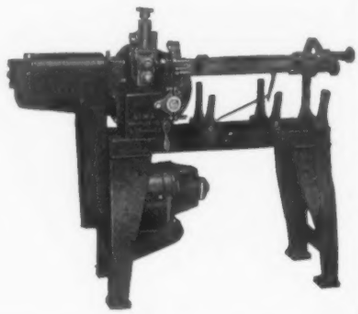
WIRE STRAIGHTENING AND CUTTING MACHINES



Built for long life and heavy service. Wire cutting economies enter your shop with your first Lewis Machine. You can't begin too soon.

TIMKEN BEARING EQUIPPED

All main drive units are mounted on Timken Roller Bearings. Steel cutter bar. Hardened Alloy Steel Clutch Plate. Double V Belt Drive from motor eliminates high speed gearing.



THE LEWIS MACHINE CO.

1600 E. 24th STREET. CLEVELAND, OHIO

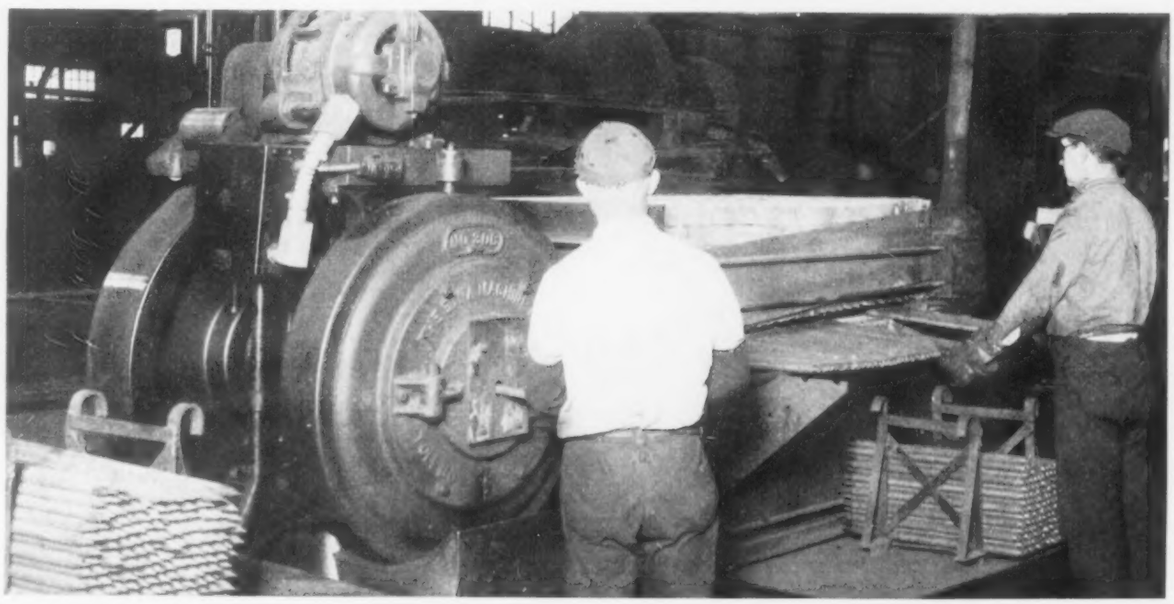
PEAK PRODUCTION
with ETNA
SWAGING MACHINES
in the
BLAW-KNOX PLANT
Pittsburgh, Pa.

Below is shown a HOT swaging operation in which solid, soft steel rods, 1½ in. diameter, are brought down to a sharp point in two inches. This is a faster and superior method.

THE ETNA MACHINE CO.

Write for Estimates to
Equip Your Plant

TOLEDO, OHIO



WIRE MACHINERY

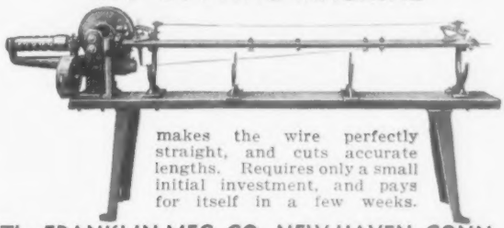
Equipment for

SPRING MAKING
SPECIAL COILING
CABLE ARMORING
LOCK WASHERS
NAILS & STAPLES
WIRE DRAWING
WIRE ROLLING

SLEEPER & HARTLEY, Inc.
WORCESTER, MASS.

CRACKER JACK

AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE



makes the wire perfectly straight, and cuts accurate lengths. Requires only a small initial investment, and pays for itself in a few weeks.

The FRANKLIN MFG. CO., NEW HAVEN, CONN.



THE
DAYTON
TORRINGTON
SWAGING MACHINE

—with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Modern Art of Swaging."

The Torrington Co., Excelsior Plant
55 Field Street — Torrington, Conn.

Use *COILED STOCK* and
Littell Roll Feeds
with Straighteners on your punch presses. MAKES FOR SAVINGS ON MATERIAL, less labor and sustained running. For Feeds write,
F. J. LITTELL MACHINE CO.
4127 RAVENSWOOD AVE., CHICAGO, ILL.

ELEVATORS
Steam
Hydraulic

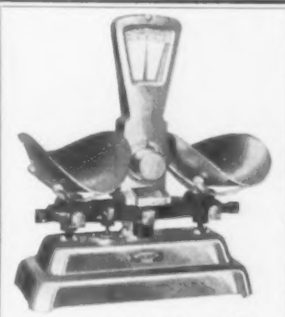
The Ridgway Steam Hydraulic Elevator is PERFECTION for the man who has steam or air available.

Hundreds in use in Biggest Plants

"HOOK 'ER TO THE BILER!"

CRAIG RIDGWAY & SON CO., COATESVILLE, PA.

EXACT WEIGHT SCALES



New Model No. 109B

Fast weighing accuracy simplified in the count of small articles by volume substitution.

Time-saving—Labor-saving.

Visible indication of the slightest variation over or short makes this equipment indispensable for production purposes or for inventory.

Weighs perfectly in out-of-level position.

Write for particulars of precision instruments for industrial weighing from 1/100-oz. to 300-lbs.

The Exact Weight Scale Co.
2001 W. 5th Avenue
Columbus, Ohio



The **SCALE** that's built for **Scotchmen**

YES, Buffalo Scales are built for Scotchmen ...and all other men who believe in giving honest weight...*but not overweight.* They're built for the scale user who wants to be sure his profits don't dribble away in over-measures.

Buffalo Scale Accuracy *is not ordinary* accuracy ...it is an extra-fine precision which is apparent at the start, and which becomes more impressive as months and years roll by.

The reason for this accuracy lies largely in the design of Buffalo Scale Suspension Bearings, which any unbiased engineer will recognize *as lower in friction and higher in sensitivity* than any other scale bearings used today.

On those other features...strength, ability to weigh off-center loads, and operating economy...Buffalo Scales invite your careful comparisons.
Write for literature.

BUFFALO SCALE CO., INC.
1202 Niagara St., Buffalo, New York



This is the Standard Buffalo Motor Truck Scale made in 10, 15, 20 and 30 ton capacities.

BUFFALO SCALES

"THE TRUSTWORTHY"

BUFFALO NEW YORK PITTSBURGH DETROIT CLEVELAND PHILADELPHIA CHICAGO DALLAS

Owen Buckets

Stronger and Built to Last Longer, Owen Buckets get "A Mouthful at Every Bite" and More Bites Per Day.

OWEN BUCKET CO.
6011 BREAKWATER AVE. CLEVELAND, OHIO

Conveyors:- CONVEYORS FOR HANDLING ALL KINDS OF LOOSE AND BULK MATERIALS

DRAG POWER PROPELLED FREIGHT
THE "ACE" TROUGH UNDERCAR SECTIONAL

PORTABLE MACHINERY COMPANY
CHICAGO CLIFTON, N.J. MONTREAL

ELECTRIC **ROEPER** HAND POWER
TRAVELING CRANES
ROEPER CRANE & HOIST WORKS Inc.
READING, PA.

TELEPHONE BARCLAY 2133 **N.B. PAYNE & CO.** 25 CHURCH ST. NEW YORK

Overhead electric CRANES and HOISTS
Fine equipment. Prompt shipment. Attractive prices.
See page 382

Electric Traveling Cranes
Foundry Equipment
Special Machinery, Evaporators, Chemical Machinery, Pulverized Coal Equipment, Stokers.
Whiting Corporation
HARVEY, ILL. (Chicago Suburb)

A type of Crane for Every Purpose

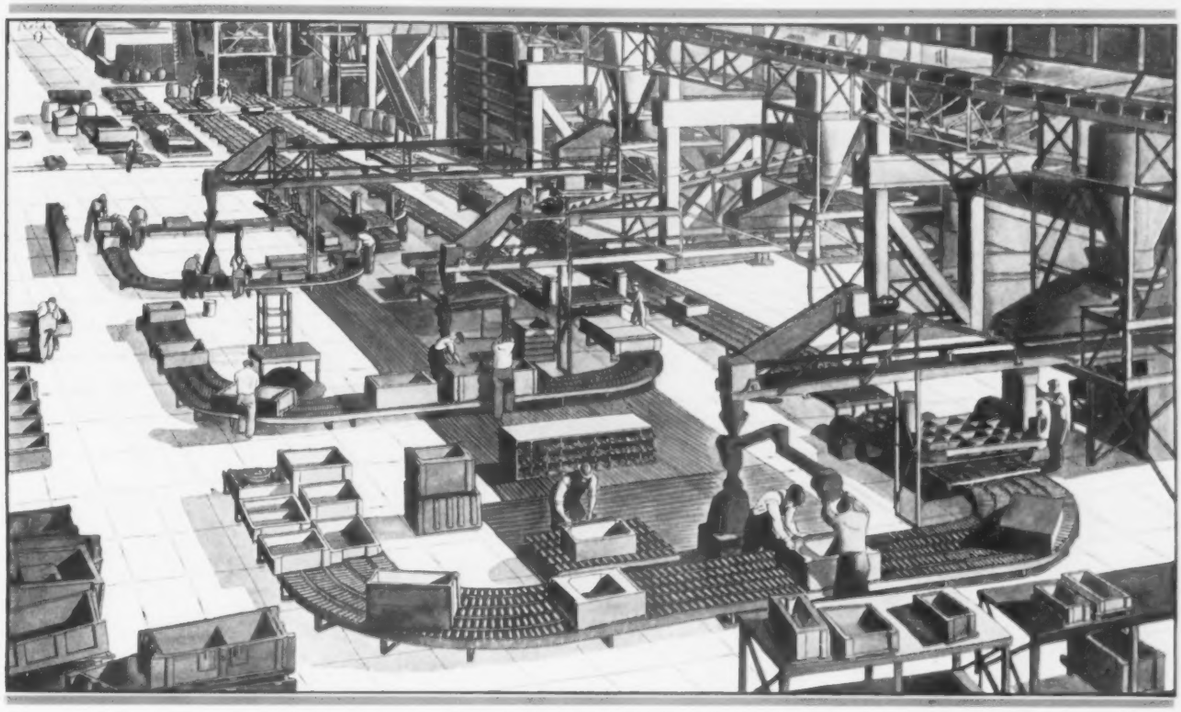
SHAW CRANE WORKS
MANNING MAXWELL & MOORE, Inc.
NEW YORK

Traveling Cranes and Hoists
Electric Revolving Cranes
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TRAVELING CRANES & I BEAM TROLLEYS
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PAINTS . . . . LUBRICANTS . . . . and MATERIALS HANDLING EQUIPMENT



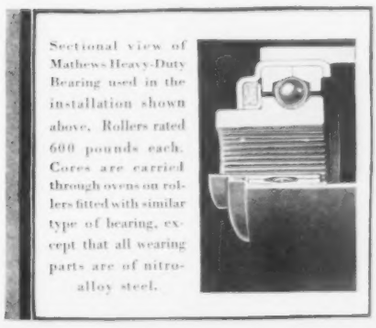
Core-making department of the new Eddystone plant of the General Steel Castings Corporation. Equipped with a Mathews Conveyer System.

NO CRYSTAL GAZING or reading of the stars entered into it. Every step of that research conducted by a leading business publication was as thorough as a customs officer's exploration.

You, and thousands of other executives, were found to possess a new consciousness . . . a new awareness of the value of industrial *paints, lubricants and materials handling equipment.* Minds were discovered dwelling on these three important essentials to maintenance and production, and the fact that Mathews designed as many conveying systems in the first six months of 1930 as in the corresponding period of the record breaking year of 1929 proves conclusively that those thoughts concerning materials handling equipment are not idle ones.

When your thoughts turn to handling equipment, consider Mathews Conveyer Systems. Study the unusual design and sturdy construction . . . closely examine the features in roller, belt, chain and other units if you would know technical superiorities. Go with the nearest Mathews representative to plants where Mathews Conveyer Systems are in action if you would like a thorough-going demonstration of performance. Question production men who daily entrust their conveying jobs to Mathews equipment. Do these things, and likely you'll join the ranks of Mathews users.

An interesting reference book on conveyer engineering and applications, fitting right into your trend of thought, will be sent on request. You'll find it mighty helpful and full of good ideas on handling.



Sectional view of Mathews Heavy-Duty Bearing used in the installation shown above. Rollers rated 600 pounds each. Cores are carried through ovens on rollers fitted with similar type of bearing, except that all wearing parts are of nitro-alloy steel.

MATHEWS
CONVEYER SYSTEMS

Mathews Conveyer Company . . . 114 Tenth Street . . . Ellwood City, Pa.

Birmingham . . . Boston . . . Buffalo . . . Charlotte . . . Chicago . . . Cleveland
Dallas . . . Denver . . . Detroit . . . Los Angeles . . . Milwaukee . . . Minneapolis
New Orleans . . . New York . . . Philadelphia . . . Pittsburgh . . . St. Louis . . . San Francisco . . . Seattle . . . Mathews Conveyer Company, Limited, Port Hope, Ontario

Where else can you make such savings in production in 1931?





Saving $15,000 per year

IF you are not making full use of electric industrial trucks, economies in materials handling offer you a most promising opportunity for cost reduction in 1931.

Of the thousands of Elwell-Parker Electrics in use, *each is saving on the average, $400 per month* in handling costs . . . some $1200. Figure for your yourself how these savings would effect your present costs . . . your profits.

Saving $7500 per year

Right now—while you are planning for next year—plan for lower handling costs. Improvements made now will generate cumulative savings that will carry through business depression and prosperity alike. Review your methods of handling incoming materials and supplies . . . of moving materials in process from machine to machine . . . of transporting finished product to storage and shipping platform.

At many points, Elwell-Parker electric trucks can do the job faster . . . and at 50% lower cost. An Elwell-Parker Field Engineer will tell you how. Ask him.



Saving $14,000 per year

THE ELWELL-PARKER ELECTRIC COMPANY, 4225 ST. CLAIR AVENUE — CLEVELAND, OHIO

SHIP on SKIDS

* *Low center of gravity is a notable Elwell-Parker feature. It assures greater stability on curve, level or incline, and permits placing the operator nearer the load, giving him a clear and unobstructed view ahead.*

Elwell·Parker

Designers and Builders of Electric Industrial Trucks, Tractors and Cranes for a Quarter Century

Handle *this year* ..with a Hayward

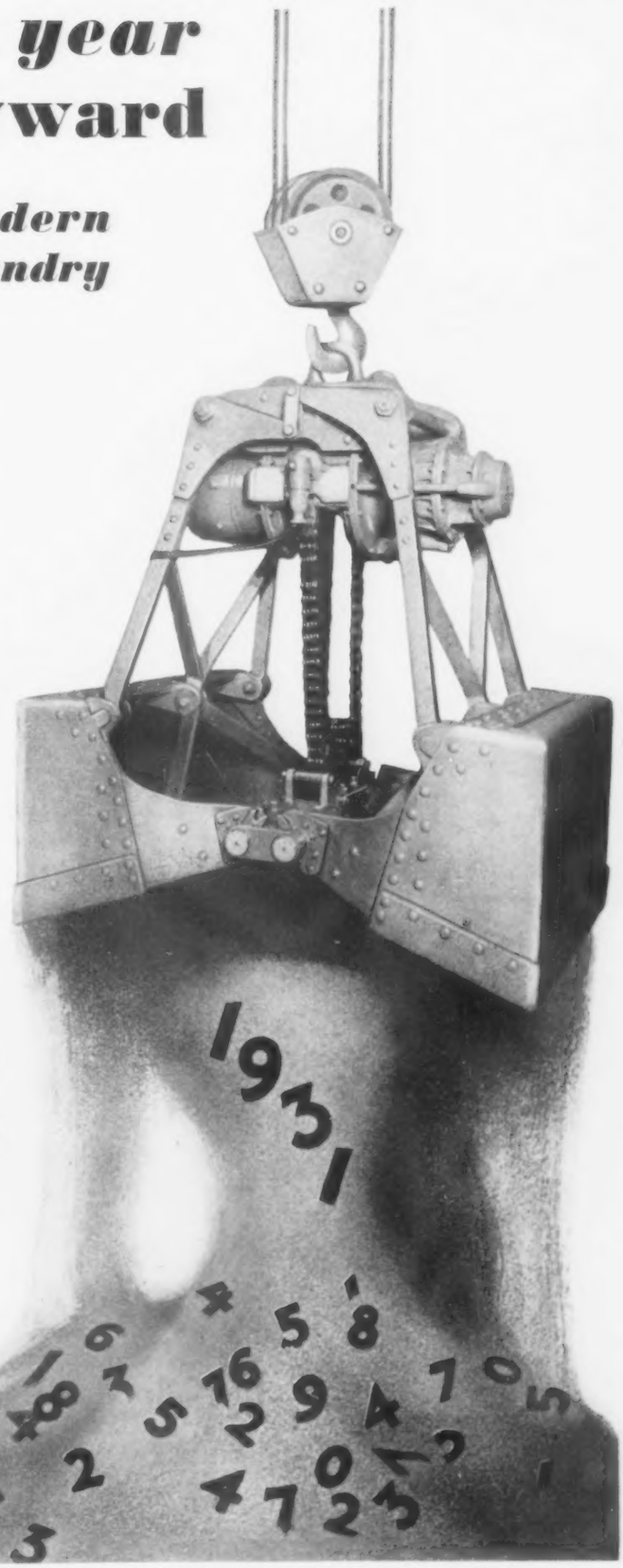
. . . *finest, most modern equipment for the foundry*

FOUNDRY SAND, slag, coal, coke . . . handling these and other materials is a job for a Hayward Electric Motor Clam Shell Bucket.

This Hayward is a *real bucket* for doing a *real job* in and about the foundry. It is no makeshift. A Hayward Electric Bucket is designed for foundry service. It is built to make good and it does.

A shell of open hearth steel plate . . . connecting rods of forged steel braced diagonally . . . bronze bushed bearings . . . pins and shafts of high carbon turned steel . . . Alemite lubrication . . . these are just a few of the mechanical refinements that make the Hayward Electric Motor Clam Shell Bucket the finest, most modern equipment for the foundry.

THE HAYWARD COMPANY
46-50 Church Street, New York, N. Y.
405 Chester Twelfth Building., Cleveland, Ohio



Hayward Buckets

ELECTRIC MOTOR, ORANGE PEEL, CLAM SHELL DRAG LINE

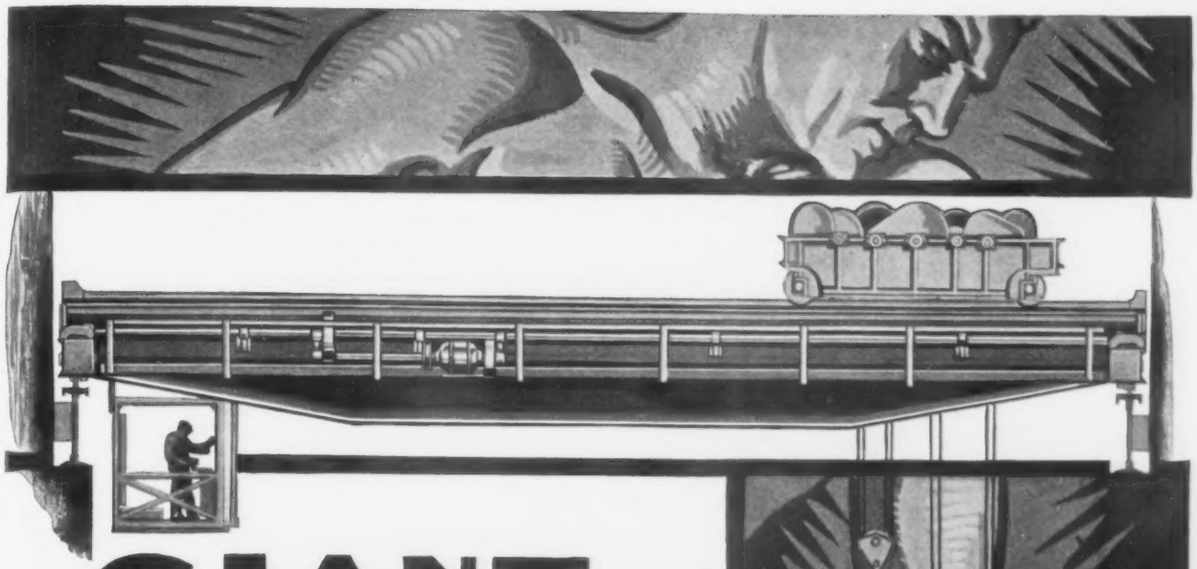
HAYWARD BUCKETS — DIG FOR ALL THE WORLD

TRADE HAYCO MARK



POWER—sturdy simplicity—highly advanced engineering—these and more, combine to produce in this new unit a hoist that out-performs any of like capacity which have ever left the EUCLID factory. *Write for bulletin 110—see the Type 12 in action—before you buy a hoist!*

THE
EUCLID CRANE & HOIST CO.
EUCLID, O.



GIANT POWER!



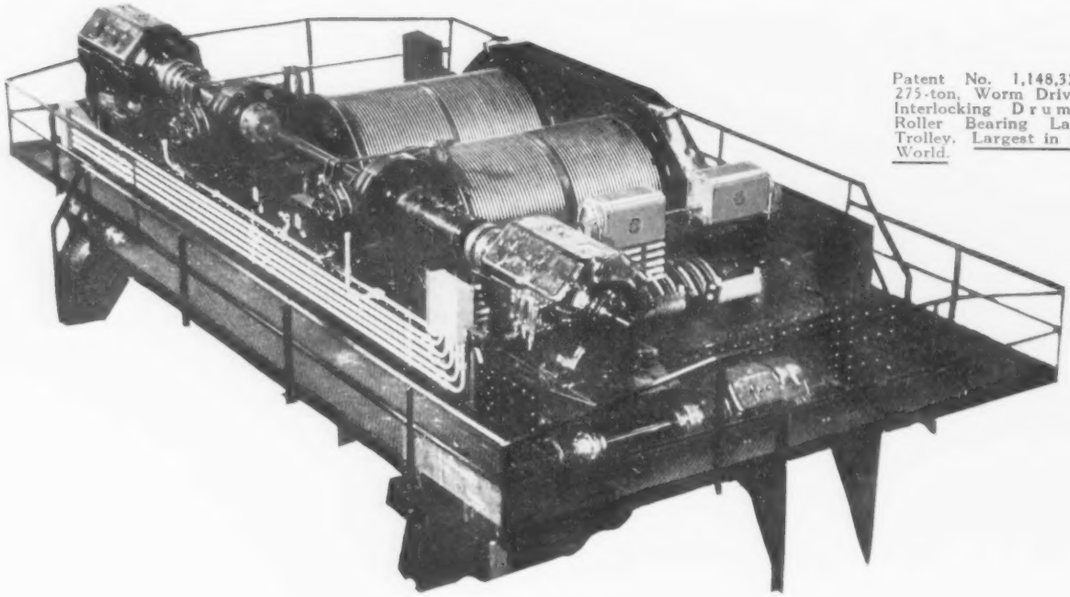
Giant Power embodied in ARMINGTON CRANES insures handling your heaviest loads with perfect control. Only giant power will start and stop them with smoothness and apparent ease.

Safety and perfect performance are vitally important and are obtained only by having a reserve factor of strength and power. Armington Cranes are designed with liberal factor of safety which shows itself in longer life and better performance of the equipment and is reflected in the barest minimum of repairs and maintenance.

Don't fail to send us your inquiries for overhead traveling cranes in any capacity.

The **ARMINGTON ENGINEERING** *Co.*
Euclid, Ohio

"Largest Builders of the World's Largest Cranes"



Patent No. 1,148,323. 275-ton, Worm Driven, Interlocking Drums, Roller Bearing Ladle Trolley. Largest in the World.

ORIGINATORS
Since 1901

The Four Girder Ladle Crane
The Interlocked Drum Ladle Trolley
The Rope Stripper
The One Piece Cast Steel Trolley
The Worm Driven Ladle Trolley
The Forging Manipulator

More Pending

The
ALLIANCE MACHINE CO.
Engineers and Builders
ALLIANCE, OHIO, U.S.A.

"Give Us the Runway and We Will Lift the World"

Alliance Products

STANDARD CRANES
Up to 430 tons capacity
STRIPPING CRANES
Up to 320 tons capacity
COMBINATION
CHARGERS and
STRIPPERS
Up to 200 tons capacity

Ladle Cranes
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Soaking Pit Cranes
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Ore and Coal Bridges
Car Dumpers
Forging Manipulators
Steam Drop Forge Hammers
Coke Pushers, Levelers and Door Lifters
Coal Pier Equipment
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Cement Plant Machinery
Dock Handling Equipment
Coke Oven Equipment

SPEED BOAT PRODUCTION



THIS MARIS CRANE is a part of the **PRODUCTION SYSTEM** at one of the largest plants making **Speed Boats** and **Cruisers** on the automobile production scheme.

Its use allows an **OBVIOUS SAVING** over old fashioned rolls and skids.

MARIS CRANES and **HOISTS** serve unnoticed, but in a thoroly reliable manner practically every branch of industry—from boats to straw hats.

MARIS BROS. INC.

EST. 1886

5538 Grays Ave., Philadelphia, Pa.

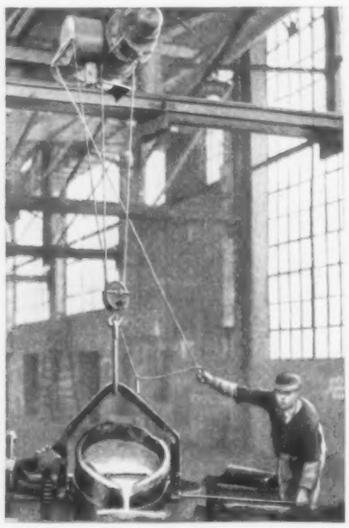
Useful Data Bulletins Furnished at Your Request

Multi-Speed

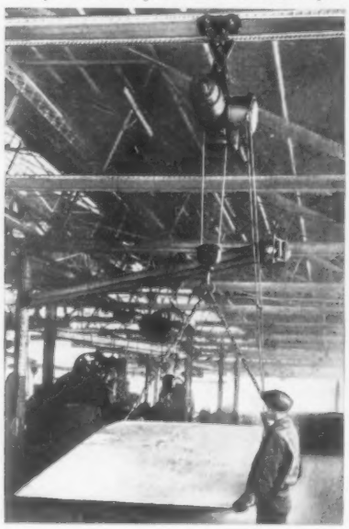
LOAD-HANDLING *efficiency*



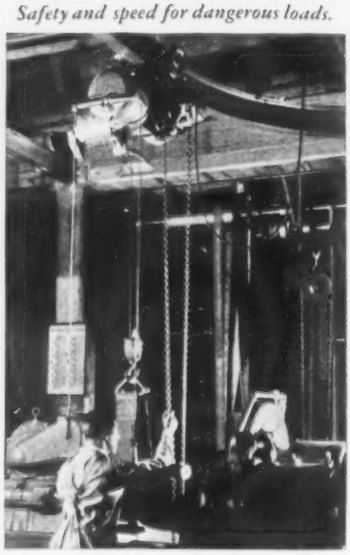
Perfect control for machine assembly.



Safety and speed for dangerous loads.



Accuracy for handling unwieldy loads.



Precision handling increases production

JOGGING the load . . . pulling an arc on the contacts! They are both poor substitutes for control. Shorter life for the hoist, increased maintenance plus inefficient handling is the result.

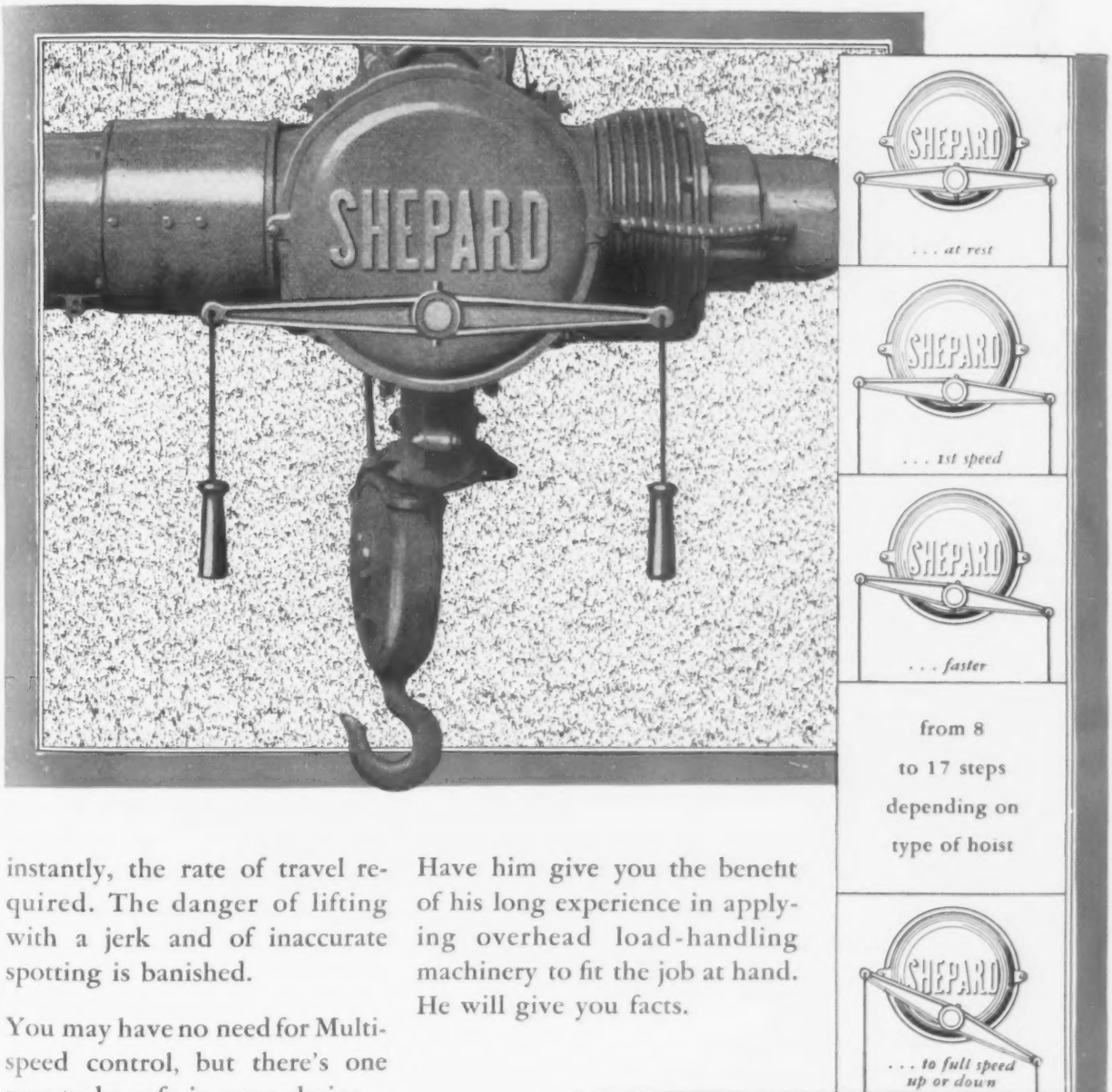
True, hundreds of lifting operations . . . where accuracy of handling is not of importance... may be satisfied with single speed control. But bear this in mind ... Multi-speed control is always the safest, regardless of the service. Single speed is often a mistake.

In the foundry, in the machine shop, in the assembly line, and in hundreds of other places, economical handling permits of no compromise with precision control. With Shepard Multi-speed control you have available

The most complete line of cranes and hoists in America.

SHEPARD
CRANE & HOIST DIVISION

Control MULTIPLIES



instantly, the rate of travel required. The danger of lifting with a jerk and of inaccurate spotting is banished.

You may have no need for Multi-speed control, but there's one way to be safe in your choice... send for a Shepard Engineer. Have him give you the benefit of his long experience in applying overhead load-handling machinery to fit the job at hand. He will give you facts.

SHEPARD NILES
CRANE & HOIST CORP.
Montour Falls, N.Y.
Works, Montour Falls and Philadelphia, Pa.



SHEPARD NILES CRANE AND HOIST CORPORATION
356 Schuyler Ave., Montour Falls, New York

Gentlemen:— Please send me.....copies of
☐ Hoist Bulletin ☐ Illustrated Economies

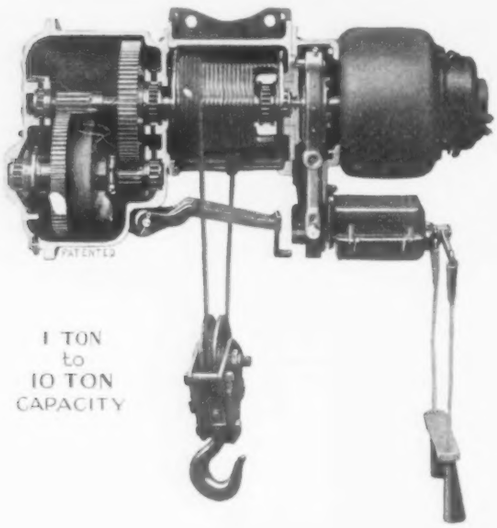
NAME.....

FIRM.....

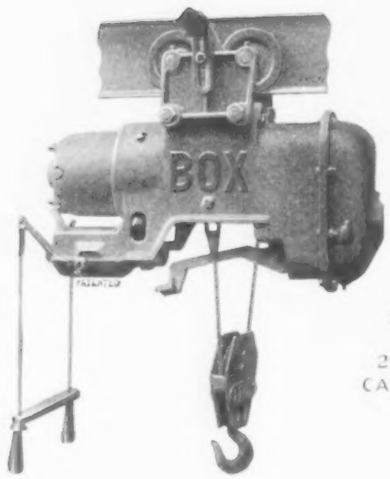
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BOX LOAD LIFTER ELECTRIC HOIST

MOST RUGGED AND ECONOMICAL HOIST BUILT
92% MECHANICAL EFFICIENCY
ALL STEEL SUSPENSION



1 TON
to
10 TON
CAPACITY



500 lb.
to
2000 lb.
CAPACITY

HEAVY DUTY ELECTRIC AND HAND TRAVELING CRANES
MADE IN EVERY SIZE AND TYPE FOR EVERY DUTY

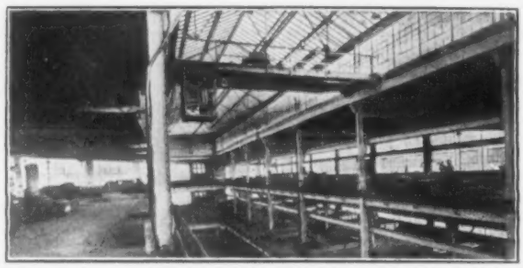
LOW HEAD ROOM
BOX TYPE CRANE

LIFTS ITS LOAD WITHIN 18 IN. OF CEILING

DETAILED SPECIFICATIONS ON YOUR REQUIREMENTS
CHEERFULLY FURNISHED

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BOX CRANE & HOIST CORPORATION
E. ONTARIO AND JANNEY STREETS
PHILADELPHIA, PA.
Representatives in principal cities



AMERICAN "HY-HOOK" CRANES & HOISTS

AMERICAN CRANE

First to be equipped with roller bearings.
First to be equipped with hardened steel pinions and forged steel gears.
First to adopt all-steel arc welded construction.
The three distinguishing features of all modern cranes.

THE AMERICAN CRANE CO., Inc.
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NEW YORK OFFICE, 30 CHURCH ST.

BEDFORD CRANES

BEDFORD CRANES SERVICE

Made in all capacities—Overhead or Gantry—to suit individual requirements. Floor, cage or remote control.

Bedford Steel Stiffleg or Guy Derricks.

Bedford Foundry & Machine Co.
BEDFORD, IND.

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The system of Overhead Transportation that meets most Material Handling Requirements

THE AMERICAN MONORAIL COMPANY
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CLEVELAND TRAMRAIL SYSTEMS



Move it While You Make It

Cleveland Electric Tramrail
Division of
The Cleveland Crane & Engineering Co.
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For Your Yard Work



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CORDUROY CRANES **P&H**

Equipped with hook, bucket, clamshell or magnet, they can easily handle any kind of loose materials. Easily maneuvered on their Corduroy traction—no tracks required.

HARNISCHFEGER CORPORATION
Established 1884
4401 W. National Ave., Milwaukee, Wis.

CRANES

LOCOMOTIVE · GANTRY
CRAWLING TREAD · TRUCK
SPECIAL MATERIAL-HANDLING

CLAMSHELL AND ORANGE-PEEL BUCKETS

In addition to a complete range of standard types and capacities, ORTON Cranes are manufactured for many special-purpose applications.

These cranes are designed and built under the supervision of a staff of engineers who have had over a quarter century of experience in the construction and application of material-handling equipment.

The results of this extensive experience are available to you. If you are planning to install new equipment or to make improvements in your present material-handling methods, it will pay you to call in ORTON engineers. They will assist you in analyzing your requirements, in making plans and layouts, and in estimating the cost of equipment required and savings to be effected.

Of interest to you will be special bulletins covering various types of material-handling equipment. Ask for Folder No. 402.

ORTON CRANE & SHOVEL CO.
608 S. Dearborn St., Chicago, Ill.
Representatives in Principal Cities



ORTON
Cranes, Shovels & Buckets

OHIO

THE CRANE WITH THE 10 YEAR GUARANTEE



STEAM GAS OR ELECTRIC

15 TO 60 TON CAPACITY

LOCOMOTIVE CRANES

GANTRY CRANES, BARGE CRANES, BALLAST CRANES, ERECTION AND LOGGING CRANES

CRAWLER CRANES AND SHOVELS

The Ohio Locomotive Crane Company

BUCYRUS, OHIO

DETROIT HOISTS

ELECTRIC and PNEUMATIC
CAPACITIES ¼ to 10 TONS
DETROIT HOIST & MACHINE CO.

TERRY STEEL DERRICKS and DERRICK FITTINGS

For General Construction and Material Handling Work

AMERICAN-TERRY-DERRICK CO.
SOUTH KEARNY, N. J.

HANNA AIR HOISTS

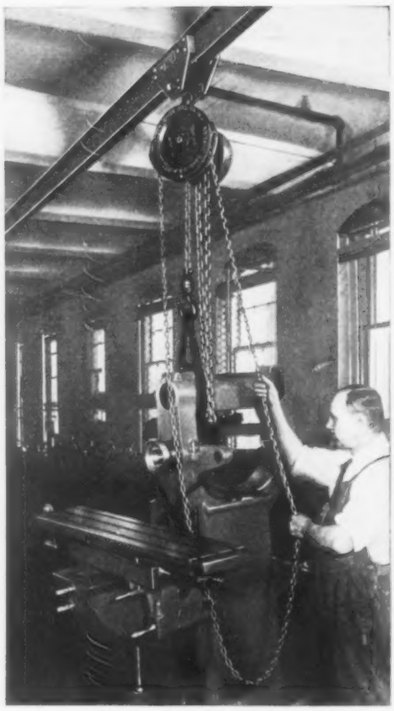
Price is a small fraction of any other type of Power Hoist

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1761 ELSTON AVE., CHICAGO, ILL.

E & M

LIFTING MAGNETS—
BRAKES—COMPENSATORS—
MANUAL & MAGNETIC CONTROLLERS
LIMIT STOPS—AUTOMATIC STARTERS
THE ELECTRIC CONTROLLER & MFG. CO.
—2700 EAST 79TH ST.
—CLEVELAND
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UNION HOISTS *Require No Repairs For Five Years or More*



Sizes ¼ to 20 Ton

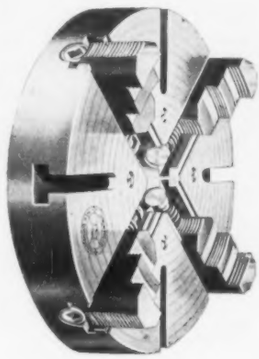
We will replace FREE any part of a Union Hoist (except chain and hand wheel) for 5 years that proves defective or wears out in ordinary use. Union exclusive features make this possible.

Reversible Load Sprocket (an exclusive feature) *insures twice the durability of unusual hoist construction*

Large Roller Bearings
Solid Load Axle Alloy Steel
Cut Alloy Steel Gears

Electrically Welded Tested Chain
Forged Steel Hooks Tested to 50% Overload

Use UNION CHUCKS for
ACCURACY and ENDURANCE



SHOP FOREMEN know good chucks and specify UNION CHUCKS because they are modern for production.

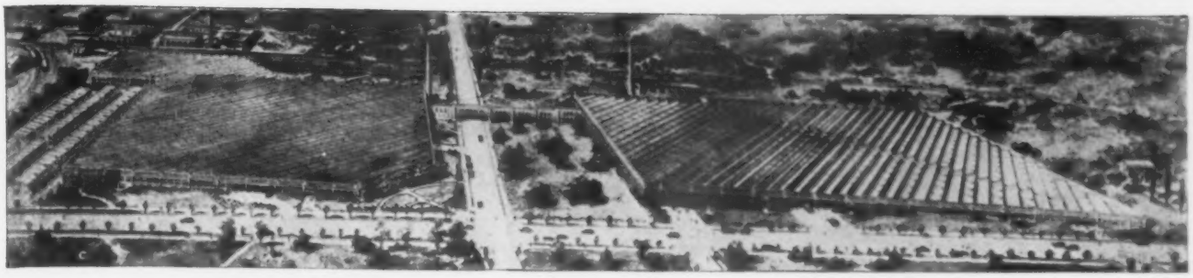
Illustration shows a UNION All Steel Independent Chuck No. 264. Records show that, after a quarter of a century of making this chuck, not one has broken while in service, and besides it has oversize jaws and screws.

Indicative of the kind of service you get in using UNION CHUCKS of every type.

Write for a Complete Catalog

UNION MANUFACTURING CO.
NEW BRITAIN, CONNECTICUT

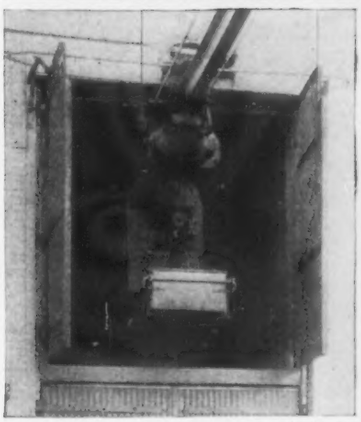
Branch Offices:
27 S. Jefferson St. Chicago, Ill.
332 Sycamore St. Cincinnati, Ohio
26 Cortlandt St. New York City, N. Y.
661 Folsom St. San Francisco, Cal.



Through Atwater Kent's modern plant cargoes of steel are carried by

LO-HED HOISTS







Above—LO-HED Hoists in the pressroom; Left—Leaving the elevator; Below—On the receiving platform.

Traveling on a simple overhead track, the hoist lifts its burden from beside the freight car, travels along the unloading platform and into an elevator. It is carried up two stories, passes out into the pressroom and deposits the steel in stacks, from which the sheets can be conveniently moved to the presses by a traveling crane (not shown in these pictures), which is equipped with a LO-HED Hoist. Note how the LO-HED utilizes every inch of headroom.

From freight car to press, tons of steel speed through this great plant by a material handling system that efficiently and economically meets the demands of modern production. In unloading, distributing and storing operations, 9 men and 2 LO-HED Hoists do work that would require 28 men by the methods formerly used. The hoists save $84.60 on labor alone for every working day.

In July, last, the LO-HEDS carried 7,630,402 pounds of steel; in August 6,949,351 pounds; in September 4,550,324 pounds. And even this is not their full capacity . . . the two LO-HEDS and a third, in reserve, were bought to provide for future expansion. They can unload 400,000 pounds . . . a 12-car train of steel . . . in a single day. Vision the savings! How quickly these hoists are paying for themselves!

Besides the three cab-hoists, Atwater Kent uses 7 other LO-HEDS of various types throughout the plant.

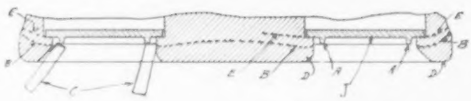
Whatever your hoisting problem, solve it the LO-HED way

AMERICAN ENGINEERING

AMERICAN ENGINEERING COMPANY, 2410 ARAMINGO AVENUE, PHILADELPHIA, PA.



WHY are OHIO MAGNETS so Reliable and Long Lived



The cut here illustrates one very important reason; namely the new annular ribs "A" and "A" on the manganese steel bottom plate "J" near center pole and outer ring. These limit wear of poles to dotted line "B" instead of "E" and thus prevent drop of magnet coil; preserve integrity of magnet structure and add materially to life of Ohio Lifting Magnets.

What is your magnet problem?

The Ohio Electric Mfg. Co.

5908 Maurice Avenue,
Cleveland, Ohio.

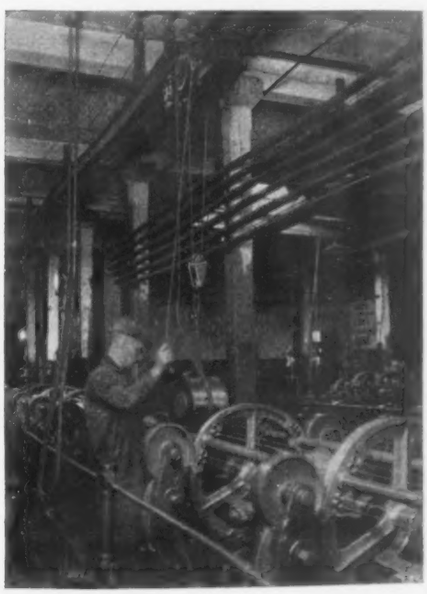
They Squander Your Profits in *Unproductive Time*



Only *Planned* Materials Handling Can Keep Your Men and Machines Supplied and Busy

PROFITS in these times depend upon lower production costs. Factory managers are bending every effort to lower costs through better production methods.

Your producing units cannot show the maximum of productive time unless the supply of materials is timed and co-ordinated to deliver materials to the machines as fast as needed.



Reading 1-ton Electric Hoist on Reading I-Beam system, in the plant of the American Cable Company. A Spool is being lowered into position in a rope winding machine. Such installations increase production and decrease production costs.

The Reading Planning Service meets this urgent need of production managers for experienced help in planning their materials handling layout. First instituted and offered to manufacturers only six months ago, many plants, both large and small, throughout the country have already taken advantage of the services of these Planning Engineers to increase their efficiency in this important part of their production layout.

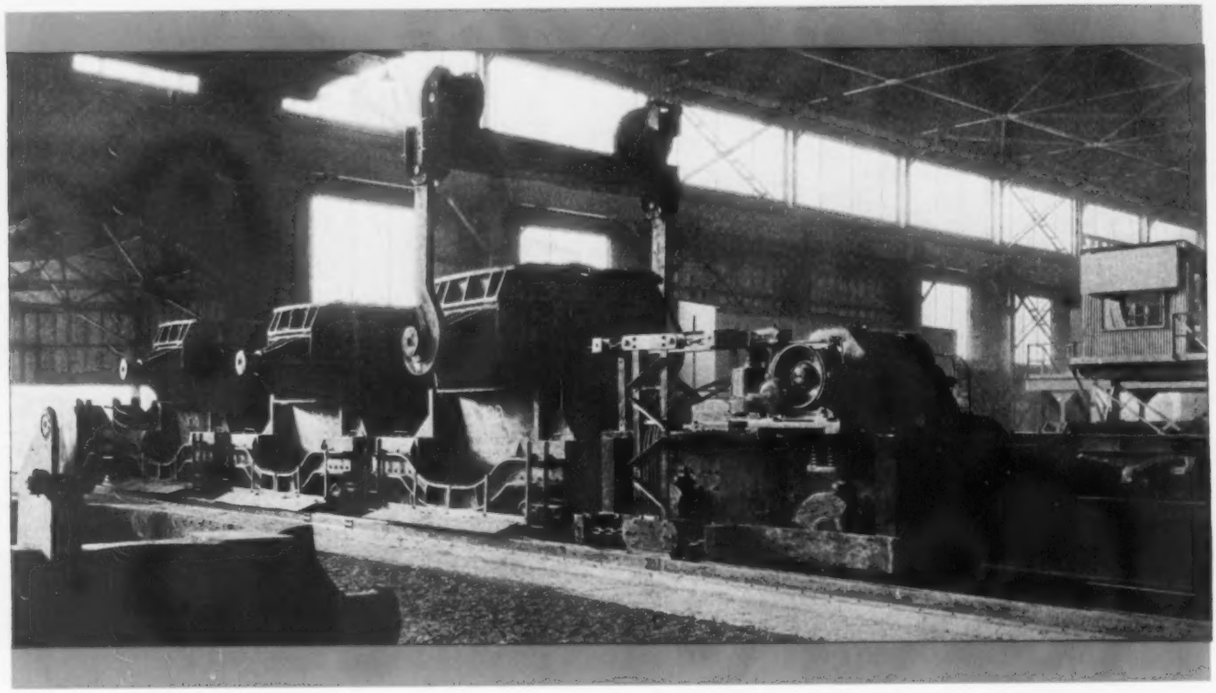
It is available without expense or obligation. An inquiry from you will bring a fuller explanation.

Reading Chain & Block Corp.
Reading, Penna.

Representatives in Principal Cities in U.S.A. and Canada

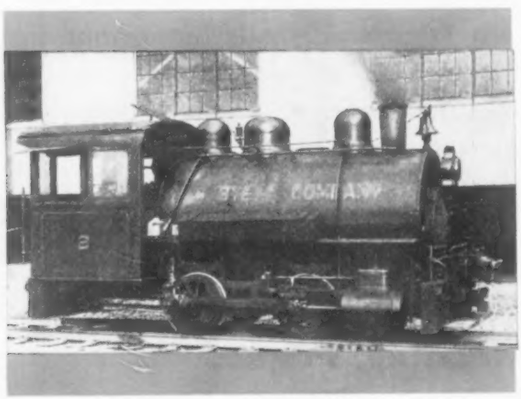
30 Years of Materials Handling Experience

PORTER serves the A. M. Byers Co.



PORTER "better built" locomotives

The 70 ton Process Locomotive illustrated above, was designed by Porter and Byers engineers, and is the only one of its kind in the world. Its duty consists of conveying ladle cars from the slag furnaces to the processing machines and then to the Sponge Ball Press. ¶ It runs on a circular track receiving current through contact rails located beneath the floor. Operation is by remote control from the processing machine platform.



Porter Locomotives of this type are to be found in practically every steel plant in United States

Porter Steam, Fireless and Specially Designed Locomotives are used throughout the steel industry.

Our engineers will be glad to confer with you

H. K. PORTER COMPANY
PITTSBURGH

Established in 1865

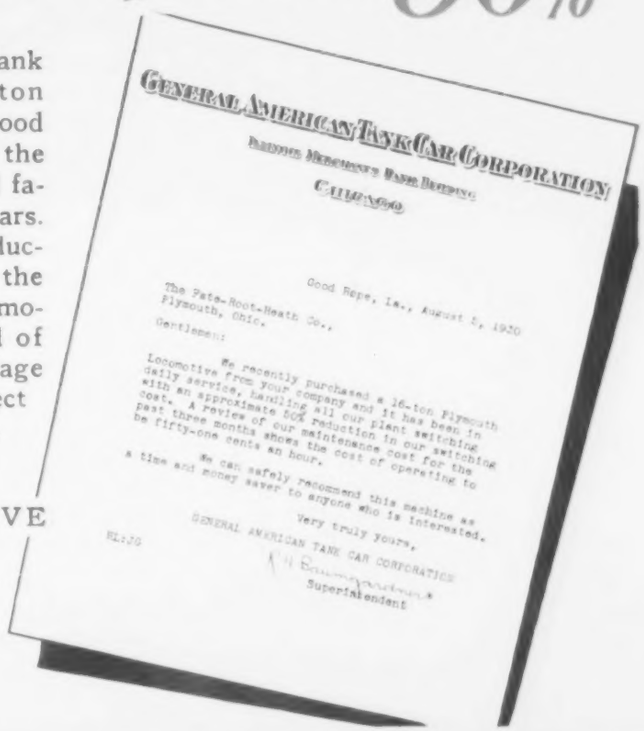
PORTER
LOCOMOTIVES



16 TON PLYMOUTH
cuts switching costs 50%

When the General American Tank Car Corporation placed a 16 ton Plymouth on the job, at their Good Hope, La., plant, it was with the thought in mind that it would facilitate speedier handling of cars. But read their letter—50% reduction in switching cost. That's the kind of service Plymouth Locomotives are giving — the kind of service every man with a haulage problem has a right to expect from his hauling equipment. Ask for literature.

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
PLYMOUTH, OHIO



GENERAL AMERICAN TANK CAR CORPORATION
PRINCIPAL MECHANICAL PLANT BUILDING
CHICAGO

Good Hope, La., August 5, 1930

The Fate-Root-Heath Co.,
Plymouth, Ohio.

Gentlemen:

We recently purchased a 16-ton Plymouth Locomotive from your company and it has been in daily service, handling all our plant switching with an approximate 50% reduction in our switching cost. A review of our maintenance cost for the past three months shows the cost of operating to be fifty-one cents an hour.

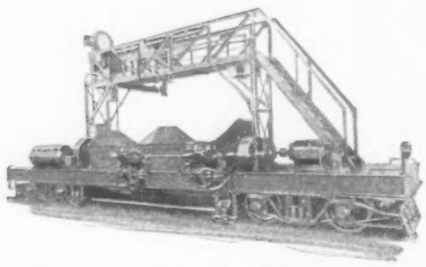
We can safely recommend this machine as a time and money saver to anyone who is interested.

Very truly yours,
GENERAL AMERICAN TANK CAR CORPORATION
H. [illegible]
Superintendent

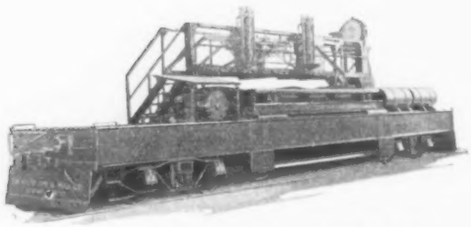
HL:JO

PLYMOUTH
Gasoline and Diesel Locomotives

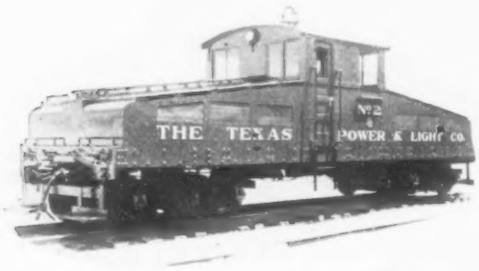
ATLAS Haulage Equipment offers Lower Haulage Costs



20-TON SCALE CAR FOR USE WITH ROLLER BIN GATES



15-TON DOUBLE COMPARTMENT SCALE CAR AIR-OPERATED GATES CONTROLLED FROM CAR



50-TON STORAGE BATTERY LOCOMOTIVE



CUPOLA SCALE CHARGING CAR

Builders of

Storage Battery Locomotives

Storage Battery Cars

Electrically Operated Industrial Cars

Scale Cars and Weighing Cars of All Kinds

All Kinds of Special Industrial Cars

Tracks, Switches and Turntables

Ore Transfer Cars and Blast Furnace Charging Cars

Pushers, Charging Cars, Door Handling Machines, and Coke Quenching Cars for By-Product Coke Ovens

The Atlas Patented Indicating and Recording Mechanism

Wheels, Axles and Car Parts and Trucks

THE ATLAS CAR & MFG. CO.

Engineers ***Manufacturers***

CLEVELAND, OHIO



KILN OR ANNEALING CAR—USED IN TUNNEL KILNS

BUY ACTIVITY

When you buy INDUSTRIAL TRUCKS

INDUSTRIAL TRUCKS justify their cost only by keeping active. Active trucks earn big dividends. "Part time" trucks suffer greatly by comparison.

Ready-Power equipped electrics keep "active" — they *always* work full time — with full power — at full speed.

Storage batteries, charging apparatus, night attendance, the delays and lost time due to their use are entirely done away with. The Ready-Power industrial truck power plant eliminates them all and is available for use on your present electrics as well as on your next new equipment.

The Ready-Power industrial truck power unit consists of a gasoline engine electric generator set of high power, and of such compact design that it may be installed in the regular space allowed for storage batteries. Operating costs are most favorable by comparison. The combination of the electric truck with its great flexibility, ease of operation and low maintenance factor, plus Ready-Power at the source of power, insures maximum performance at all times with minimum expense. Hundreds of installations in the metal working industry, railroads and steamship lines have given conclusive proof of the superiority of Ready-Power equipped electric trucks.

Write us today for further information and a copy of our new bulletin "Truck Power Every Hour"

The READY-POWER *Company*

3823 Grand River Ave. Detroit, Mich.

READY-POWER
GASOLINE ELECTRIC
for ELECTRIC INDUSTRIAL TRUCKS

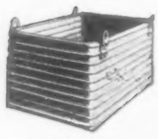




SKID PLATFORMS BOXES AND TRUCKS


Truscon 4-way Platforms

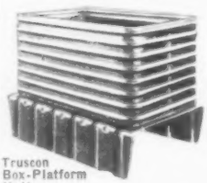

Truscon Skid Platforms


Truscon Steel Boxes

Economize your handling operations with Truscon handling equipment. Steel Boxes, Platforms and Trucks are furnished to meet individual requirements and are built to give enduring service. Write for suggestions and prices.

TRUSCON STEEL COMPANY
PRESSED STEEL DIVISION
6100 Truscon Ave. Cleveland, Ohio

PRESSED TRUSCON COLD-DRAWN STEEL

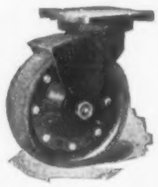

Truscon Box-Platform Unit


Truscon Six-Wheel Factory Trucks

TRUSCON



Colson CASTERS





Wherever a caster is needed, there is a Colson Caster built to fit the job exactly.

Colson Casters are the result of much painstaking development and are built to last a lifetime. Standardization on Colson Casters assures less labor, increased production and reduced maintenance expense. If your present casters are "heavy" and sluggish—if even occasional breakdowns halt production—if repairs are costing you time and money—replace now, *for the last time*, with Colson Casters.

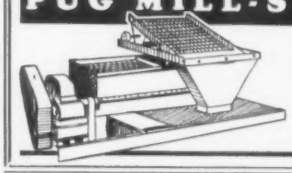
We will be glad to honor your request for a copy of our complete catalog which shows a better caster for every need.

THE COLSON COMPANY
ELYRIA, OHIO
Branches in Principal Cities



Trucks and Trailers Industrial Cars
The Chase Fdy. & Mfg. Co.
Columbus, Ohio

PUG MILL-SCREEN UNIT



BANDP Sand Screening and Cutting units for conditioning sand before conveyance to molding unit. Write for catalog of complete sand and mold handling systems.

The Beardsley & Piper Company
2541 North Keeler Avenue, Chicago

LEWIS-SHEPARD COMPANY

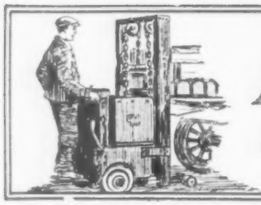
122 WALNUT STREET, WATERTOWN STATION, BOSTON, MASS.



ASSURE YOURSELF OF UNIFORMLY HIGH QUALITY BY SPECIFYING CAPE MAY SAND
UNEXCELLED FOR SAND BLASTING CORE SAND and FURNACE BOTTOM

CAPE MAY SAND COMPANY
512 WASHINGTON ST. CAPE MAY CITY, N.J.

CAPE MAY SAND CO. CAPE MAY CITY, N.J.



The WRIGHT TRUCK
for efficiency in transportation
WRIGHT-HIBBARD INDUSTRIAL ELECTRIC TRUCK CO., Inc.
Phelps New York

There is no more
profitable way for a man to invest his time than to read the journal of his chosen field.

EASTON CARS

FOR EVERY INDUSTRIAL PURPOSE

EASTON CAR & CONSTRUCTION CO. EASTON, PA.

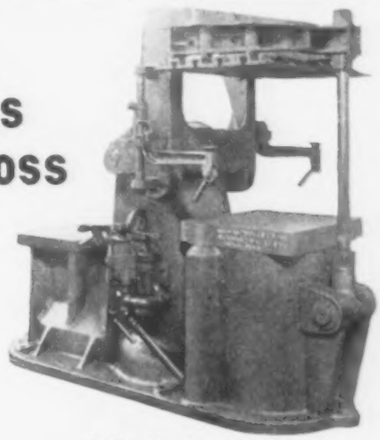
NICHOLLS
Molding Machines

Greater Production
More Uniform Castings
Lower Percentage of Loss
and
Lowest Maintenance

A Few of the Larger Foundries Who Use "Nicholls" Machines

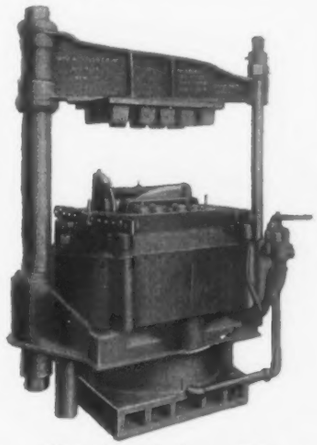


Type 11-H Jolt Squeeze and Pattern Draw



21-R H Jolt Roll-over, squeeze and pattern draw

American Mall. Co.
American Steel Foundries
Campbell, Wyant & Cannon Fdy. Co.
Chevrolet Motor Co.
Dayton Mall. Iron Co.
Eberhardt Mfg. Co.
Ford Motor Co.
General Electric Co.
General Fire Extinguisher Co.
Gartland Haswell & Rentschler
Grinnell Co.
International Harvester Co.
National Mall. & Steel Castings Co.
New Haven Fdy. Co.
Oakland Motors Corp.
Ohio Mall. Iron Co.
Pratt & Letchworth
Saginaw Mall. Iron Div.
Westinghouse Air Brake Co.

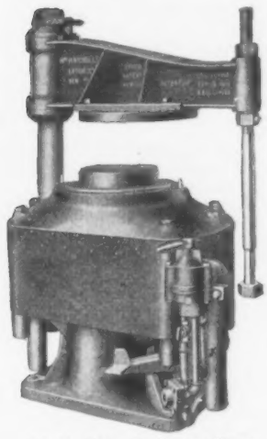


33-54 Type D Heavy Duty Jolt Squeeze Pattern Draw, with flask roll-off

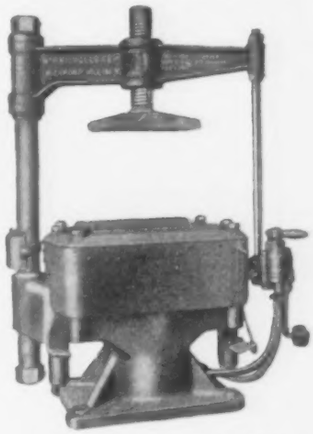


18-44 Type D Heavy Duty Jolt Squeeze, pattern draw, with flask roll-off

JOLT SQUEEZERS
(Stationary and Portable)
JOLT STRIPPERS
JOLT, SQUEEZE, STRIPPERS
HEAVY DUTY, JOLT
SQUEEZE STRIPPERS
JOLT, ROLLOVER, SQUEEZE &
PATTERN DRAW
SAND MIXERS
SAND HOPPERS & ELEVATORS
PRODUCTION MOLDING UNITS
CORE OVENS
ANNEALING OVENS



14-36 Type D Heavy Duty Jolt Squeeze and Pattern Draw



1-32 Type D Heavy Duty Jolt Squeeze and Pattern Draw

WM. H. NICHOLLS CO., INC.

Richmond Hill, Long Island, N. Y.

Detroit Office—2842 W. Grand Blvd., Detroit, Mich.

Foreign Manufacturers and Selling Agents—For Germany, Switzerland and Italy: Societe Anonyme des Acieries Georges Fischer, Schaffhouse, Switzerland.

For France: Anciens Etablissements Glaenzer & Perreaud, 18 Faubourg du Temple, Paris



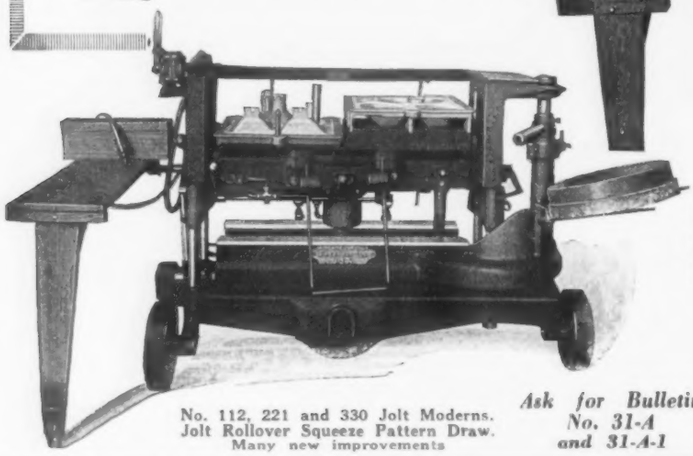
Arcade Flasks and Jackets Last Longer

Steel Jackets
No. 10 Gauge
WELL BRACED



Ask for Bulletin 31-I

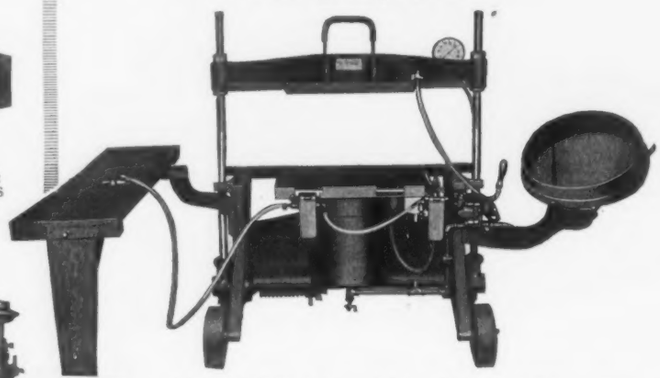
Cherry Flask
MILLED PINS
AND EARS



No. 112, 221 and 330 Jolt Moderns.
Jolt Rollover Squeeze Pattern Draw.
Many new improvements

Ask for Bulletin No. 31-A and 31-A-1

ARCADE
Molding Machinery and Foundry Equipment



No. 81, No. 91 and No. 101 Jolt Squeezer

Distance between uprights.... 32"—36"—38"
Diameter Jolt Cylinder..... 3"— 4"— 5"
Diameter Squeeze Cylinder...8½"—10"—13"

Ask for Bulletin 31-C

ARCADE MANUFACTURING COMPANY
FREEPORT - - - - - ILLINOIS, U. S. A.

An Opportunity to Save Money
Finest Quality—Clean—Evenly Graded
CHILLED SHOT
SHARP GRIT
All sizes continuously carried in stock.
Complete sample sizes and price list gladly mailed
PATCH-WEGNER CO., Inc., Rutland, Vt.
PATCH-WEGNER CORP.
35 Boulevard, Long Island City, N. Y.

SIMPSON
INTENSIVE SAND MIXERS
SAND HANDLING AND PREPARING
EQUIPMENT FOR THE FOUNDRY
NATIONAL ENGINEERING CO.
549 W. WASHINGTON BLVD CHICAGO, ILL



Reclaim every bit of valuable iron from foundry refuse *mechanically* with a High Duty Magnetic Separator. Three separations—iron, sand and slag—without hand labor. Saves 75c. to $1.20 on every ton refuse; pays for itself. Write for bulletin.

MAGNETIC MFG. CO.
626 So. 28th St., Milwaukee, Wis.
HIGH DUTY MAGNETIC SEPARATORS

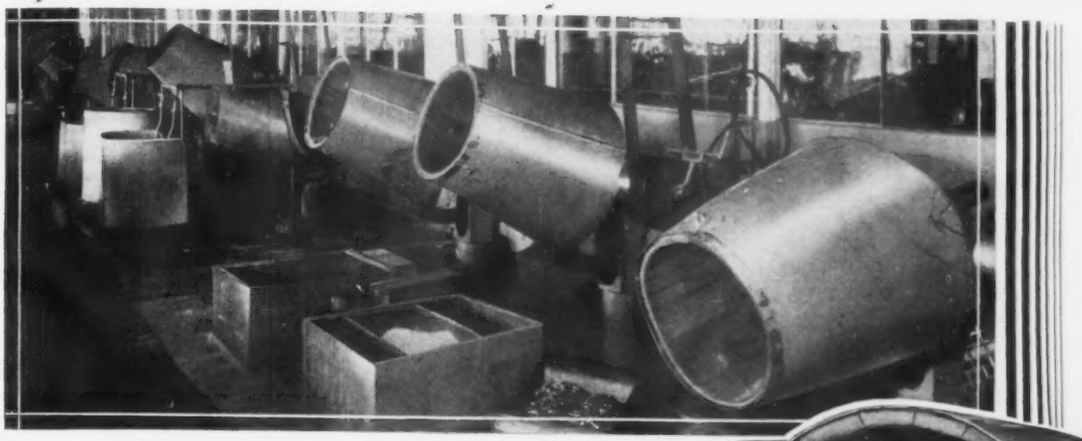
MOTT
SAND-BLAST MFG. CO. INC.
Sand Blast Machines and Allied Equipment
GENERAL OFFICE AND WORKS:
4611-4621 Flournoy Street Chicago, Ill.

ROTARY POSITIVE
Blowers
Gas Pumps
Meters
Liquid Pumps

THE CONNERSVILLE BLOWER CO. INC.
WILBRAHAM-GREEN BLOWER CO.
THE P. H. & F. M. ROOTS CO.
Comprising
THE STACEY ENGINEERING CO.
[Blower Division]
20 North Wacker Drive, Chicago, Ill.
Mount & Kentucky Aves.
Connersville, Indiana
420 Lexington Avenue, New York City

Vacuum Pumps
Acme Blowers
Victor Blowers
Acme Gas Pumps
Victor Gas Pumps

INDUSTRIAL SILICA SANDS
for blast furnace runners, open hearth and heating furnace bottoms, steel and brass molding, sand blast, traction; also cores for iron, brass and aluminum.
INDUSTRIAL SILICA CORP.
STAMBAUGH BLDG., YOUNGSTOWN, OHIO



Saving Time *Satisfactorily*

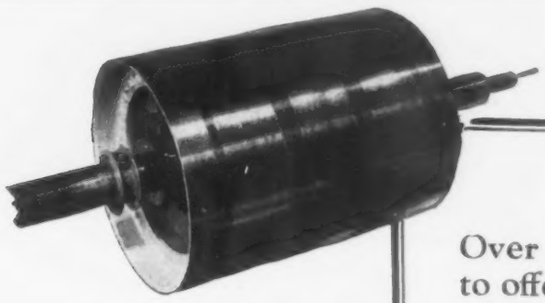


JUST as the unfailing dependability of the Atwater-Kent Radio with its Golden Voice has satisfied millions of owners, so Globe Tumbling Barrels have given entire satisfaction to the makers of this fine radio.

For over six years, day in and day out, Globe Tumbling Equipment has effected considerable savings in time; finishing and drying small metal parts in the Atwater-Kent plant.

If you make metal parts, you, too, can save time and money by using Globe Tumbling Equipment. The Globe Tumbling Book tells how. Send for it.

The Globe Machine & Stamping Co.
1250 West 76th St. Cleveland, Ohio



Be Sure to Specify HIGH INTENSITY Magnetic Separation!

Over 30 years experience qualifies Dings to offer you assistance in the purification of foundry sand, the extraction of iron from quenched slag or dump heap or the separation of non-ferrous from ferrous metals impossible for any other manufacturer of similar equipment.

DINGS MAGNETIC SEPARATOR CO.
727 Smith Street, Milwaukee, Wis.
Established in 1899

The World's largest manufacturers of Magnetic Separators

Boston: 304 Rice Bldg.
New York City: 50 Church St.
San Francisco: 273 Seventh Street
Chicago: 332 S. LaSalle Street
Branch Offices in Other Principal Cities

Dings High Intensity MAGNETIC SEPARATION

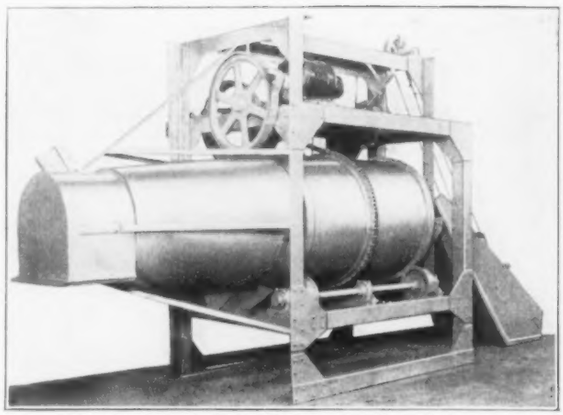
IA1-1 Gray

Perfecting the Perfect Circle

"Perfect Circle" Piston Rings, made by the Perfect Circle Co., in their Newcastle, Indiana, plant, must be *right*. Quality standards are high—inspection is rigid.

These delicate castings are tumbled in an Ideal Star Return Barrel, where they float in a charge of stars and steel shot. Reversal of the barrel discharges the load to a screen. Rings and tumbling material are separated, the rings emerging at the hooded end. Rotating the barrel again in tumbling direction automatically returns the tumbling material to the drum, ready to start work on the next batch. *No rehandling.*

This system produces a finer finish than the tumbling process it displaced and *tumbling time is cut in half.*



Ideal Star Return Tumbling Barrel with Hood

Forged, cast, stamped and drawn parts are economically cleaned in this unit. Send us 25 lbs. of parts—let us tumble them and return them with a full report of the test.

Put it up to Specialists

N. Ransohoff Incorporated

West 71st Street at Millcreek, Carthage, Cincinnati, Ohio

HERMAN
Jarr Independent Rollover and Pattern Drawing
MOLDING MACHINES

Send us your inquiry and our Service Department will gladly advise with you on your requirements.

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. . . the Metallurgical, Chemical, Ceramic and other industries use Rockwell Air-Tight Blast Gates.

Chief among them is the fact it is an air-tight gate having a slide that "stays put."

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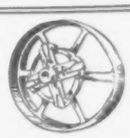


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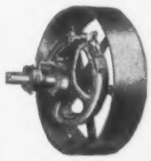
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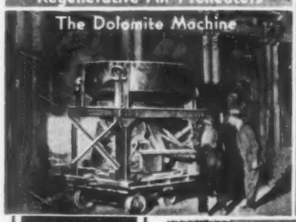
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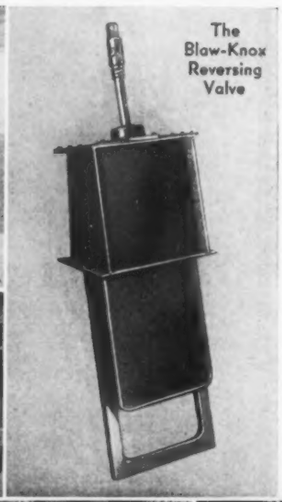
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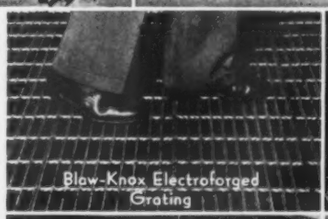
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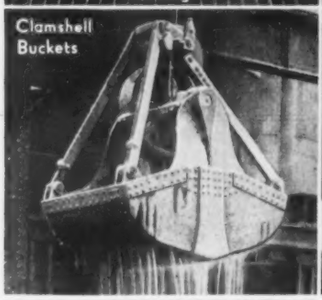
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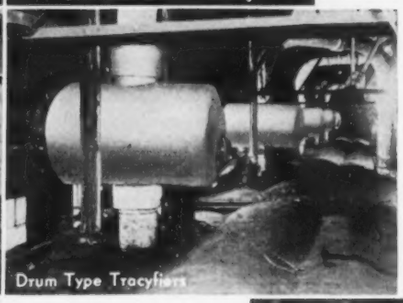
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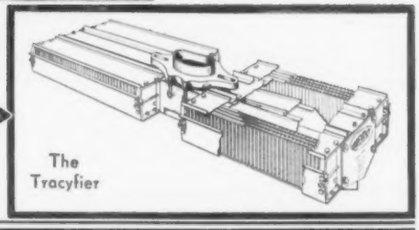

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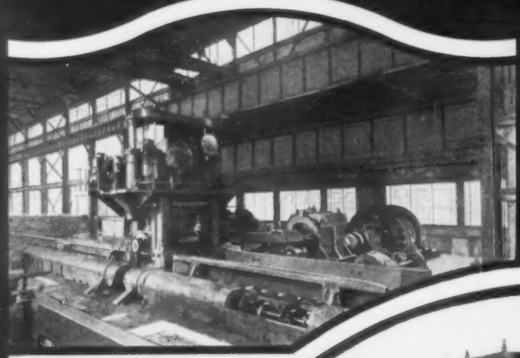
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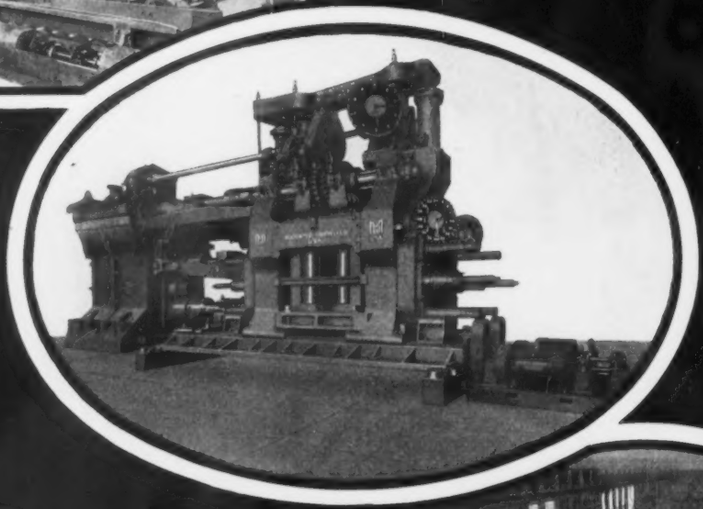
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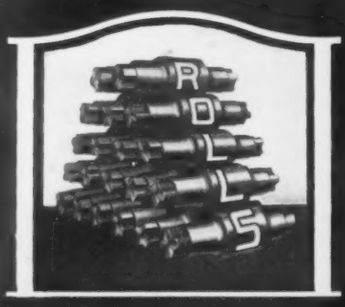
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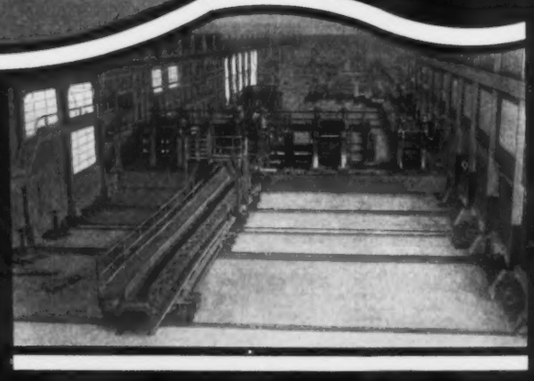
"THE BEST IN ROLLING MILL MACHINERY"



The illustrations show some of our recent Rolling Mill Equipment built to Mackintosh-Hemphill standards--"The Best in Rolling Mill Machinery"







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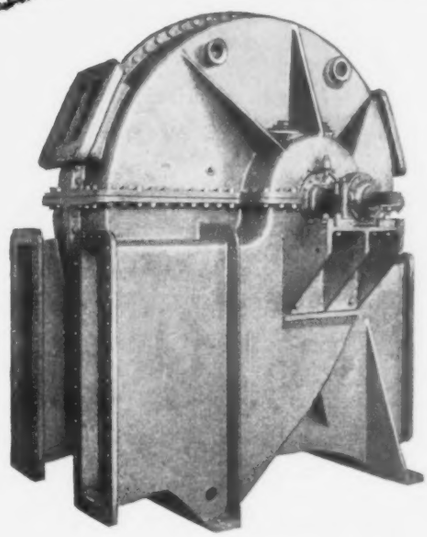
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THE MODERN LOW POWER ROTARY GAS WASHER



Our engineering staff is at your service. They will study your gas cleaning problems without cost or obligation to you.

BUILT according to best American standards of heavy construction and reliable design. Self-aligning roller bearings, heavy shaft, precision balance, rotating bars made from heat treated alloy steel forgings.

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Minimum water and power consumption with maximum cleanliness.

No Corrugated or Complicated Surfaces

No clogging or building up, machine will stay clean and maintain balance.

Uninterrupted Operation
As Demanded by American Practice

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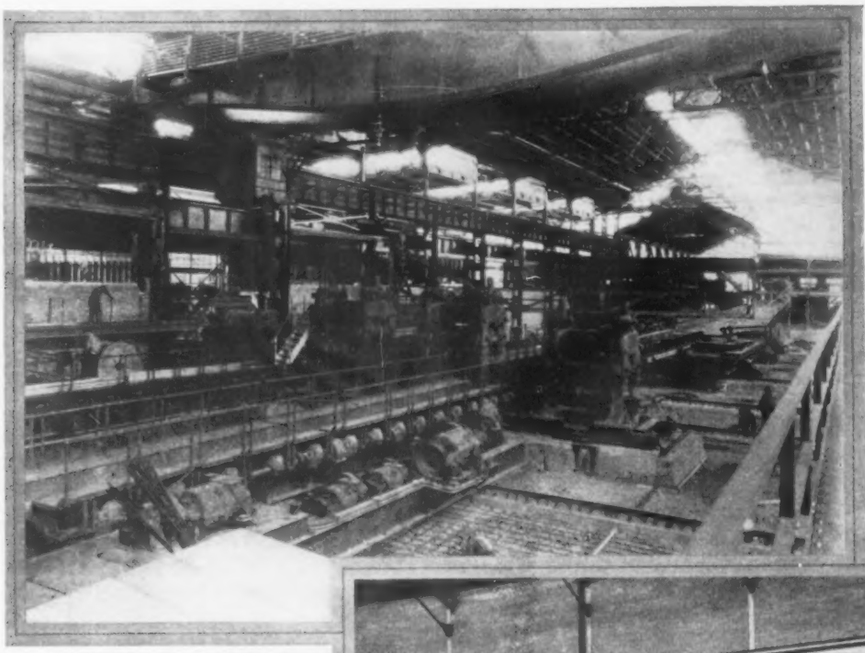
to deliver gas at stoves, boilers, open hearth furnaces, soaking pits, heating furnaces; on coke ovens with a cleanliness of .03 to .005 grains per cu. ft. as needed. Power requirements from 60 H.P. up for 50,000 cu. ft. per minute, in accordance with demand for cleanliness.

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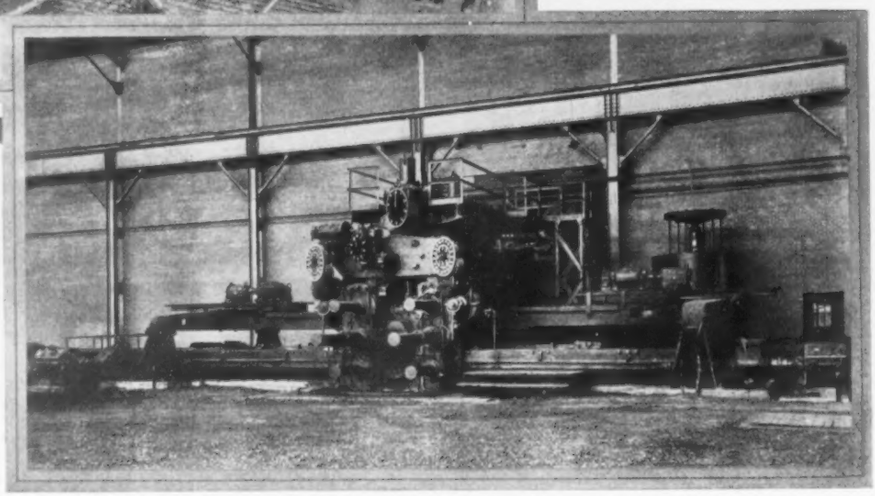


MORGAN

28" STRUCTURAL MILL

Designed and built complete for Bethlehem Steel Company.

Mill consists of two 3-high stands and one 2-high stand.



MORGAN

46" TWO HIGH UNIVERSAL PLATE MILL

Designed and built for A. M. Byers Company.

Mill will roll 84" sheared plate with vertical rolls removed.

MORGAN PRODUCTS INCLUDE:

Blooming Mills
Plate Mills
Continuous Mills
Structural Mills
Electric Traveling Cranes
Charging Machines
Ingot Stripping Machines
Soaking Pit Cranes
Steam Hammers
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Special Machinery for Steel Mills

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MORGAN QUALITY MILLS AND EQUIPMENT BUILT BY PIONEER MILL BUILDERS

Among the prominent steel companies to whom we have furnished notable mill equipment are the following:

Alan Wood Iron & Steel Co.	Two 84″ Motor Driven Plate Mills
Bethlehem Steel Co.	54″ Blooming Mill Complete
Bethlehem Steel Co.	60″ Universal Plate Mill
Bethlehem Steel Co.	35″ Blooming Mill Equipment
Bethlehem Steel Co.	18″ Structural Mill Complete
Bethlehem Steel Co.	28″ Structural Mill
A. M. Byers Co.	46″ Universal Plate Mill
Continental Steel Corp.	19″ Continuous Sheet Bar Mill Complete
Colorado Fuel & Iron Co.	28″ Structural Mill Complete
Forged Steel Wheel Co.	34″ Universal Slabbing Mill
Imperial Steel Works (Japan)	110″ Plate Mill Complete, with Buildings, Furnaces, Cranes, etc.
Imperial Steel Works (Japan)	180″ Plate Mill
Imperial Steel Works (Japan)	Rod Mill Plant Complete
Imperial Steel Works (Japan)	28″ Structural Mill
Illinois Steel Co.	60″ Universal Plate Mill
Illinois Steel Co.	24″ Continuous Billet Mill
Illinois Steel Co.	24″ Continuous Roughing Mill
Inland Steel Co.	28″ Structural Mill Complete
Otis Steel Co.	152″ Plate Mill
Otis Steel Co.	Two 84″ Plate Mills
Kiushu Steel Works (Japan)	84″ Plate Mill

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THE
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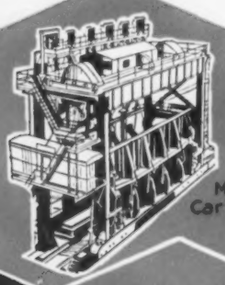
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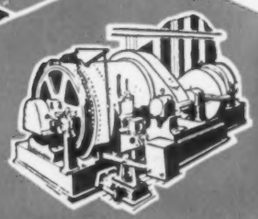
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Steel Plant Equipment - Forge Shop Equipment - Special Machinery Of All Kinds

WELLMAN

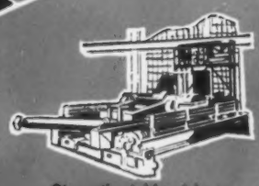
MA
and



Movable
Car Dumper

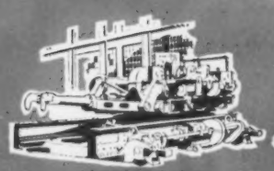


Skip Hoist



Charging Machine





Manipulator



Gas Producer

MACHINERY for IRON and STEEL PRODUCTION

From Ore Mine to Finished Product

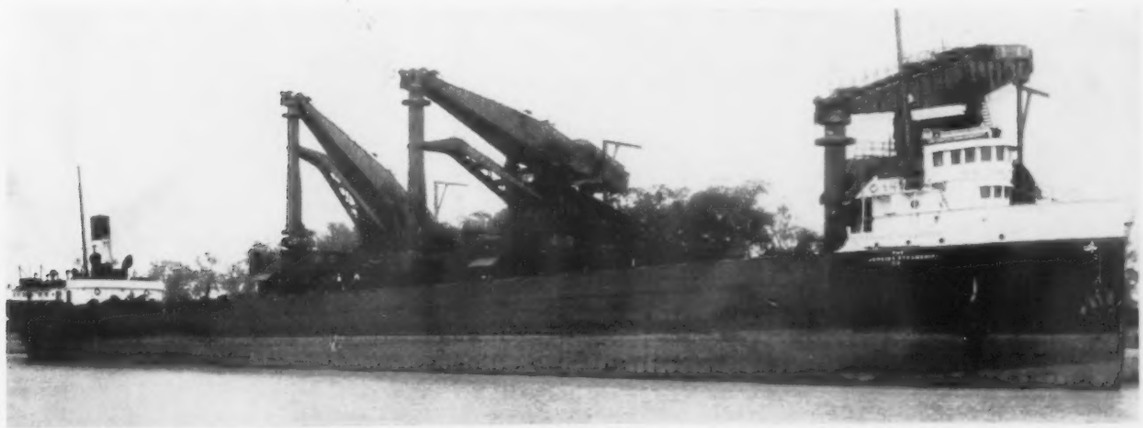
FOR more than half a century Wellman has pioneered in the design and construction of equipment for the economical handling of materials from the ore mine to the finished product—and in machinery for the Iron, Steel and Coke Industries.

Recognized as a leader in this field, Wellman is constantly striving to maintain this position—to deserve your continued confidence.

WELLMAN PRODUCTS INCLUDE:

Steel Mill Equipment	Car Dumpers of all types	Safety Stops for Traveling Bridges
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Gas Producers, Flues, etc.	Coke Oven Machinery	Mining Machinery
Gas Reversing Valves		

Castings and Machine Work to Customers' drawings



THE WELLMAN ENGINEERING CO.

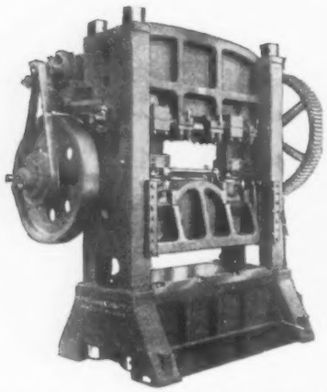
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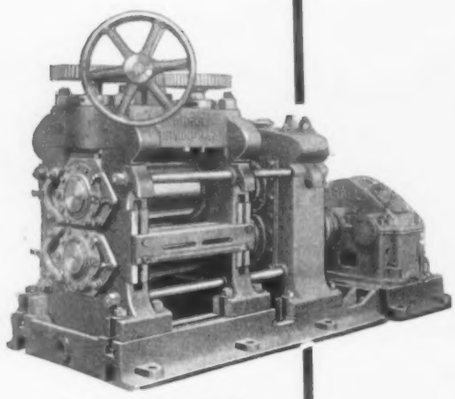
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"Canadian Wellman-Seaver-Morgan Co. Limited," 307 Reford Bldg., Toronto—821 Castle Bldg., Montreal
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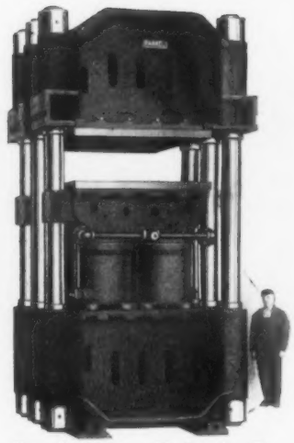
Formerly THE WELLMAN-SEAVER-MORGAN CO.



L & N Straight Sided Double Crank Press



Farrel Rolling Mill



Farrel 2000-ton Hydraulic Press

FARREL-BIRMINGHAM

Metal Working Equipment



Farrel Indicating Caliper

The several divisions of the Farrel-Birmingham Company offer a diversity of modern tools and equipment for various branches of the metal industry.

Farrel-Birmingham Rolling Mills are made in a wide range of sizes and constructed with the greatest accuracy and precision. Unusual features contribute to low power consumption, maintenance expense and labor costs, increasing production and profits.

Farrel Heavy Duty Roll Grinders are thoroughly modern machine tools with many exclusive features of design that increase the efficiency of grinding, reduce maintenance costs, and produce a high quality of work.

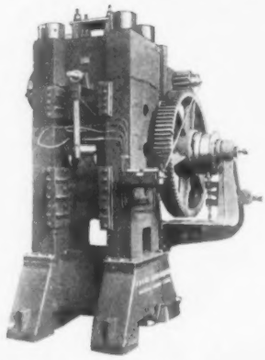
Farrel Indicating Calipers are invaluable for the accurate measurement of rolls. They are light and easily manipulated and will show the slightest variation in diameter of a roll at any point in its length, as well as measure the crown or concavity.

Farrel-Birmingham Heavy Duty Presses offer an extensive range of sizes and types for a variety of applications—Hydraulic Presses for flanging, bending, straightening and forming of metals—Straight Sided, Single and Double Crank, Tie Rod Presses and Press Brakes for cutting, blanking, stamping and shaping both light and heavy gauge sheet metal—Knuckle Joint Presses for embossing, coining, extruding, cold swaging, the compressing of fiber or composition products, etc. A competent engineering staff is available for the designing of special presses for extraordinary requirements.

M & P Drop Hammers and Automatic Lifters are especially designed for stamping sheet metals, forming silverware, forging, bending and straightening of metals, etc. The knowledge gained from many years experience in this field is embodied in their construction and they are noted for their superior design and durability.

M & P Blast Gates are designed for controlling the flow of air, gas, heat, granular materials and other substances transmitted through pipe lines. A variety of types and sizes offers a complete selection.

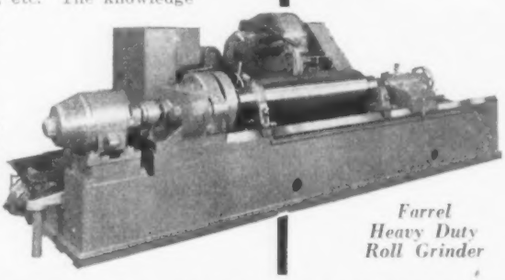
Full information about any Farrel-Birmingham products is available upon request.



L & N Knuckle Joint Press



M & P Blast Gate



Farrel Heavy Duty Roll Grinder



M & P Drop Press

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ANSONIA, CONN.

Successors to
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Birmingham Iron Foundry (Est. 1836)

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WE BUILD

COMPLETE MILLS

FOR THE MANUFACTURE
OF

SEAMLESS TUBING

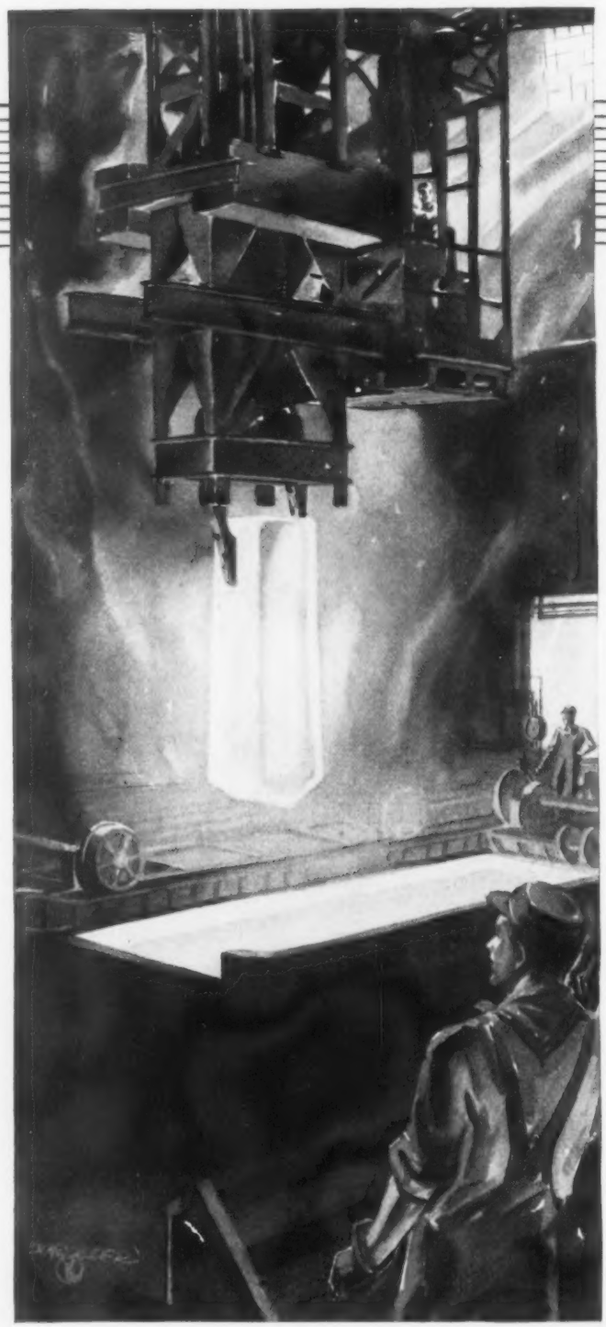
AND

LAP and BUTT WELD PIPE

WHEN PLANNING YOUR NEW MILL OR ADDITIONS OR CHANGES TO YOUR PRESENT MILLS, CONSULT OUR ENGINEERS. THEY WILL BE GLAD TO WORK WITH YOU.

TAYLOR-WILSON MFG. CO
ENGINEERS-FOUNDERS-MACHINISTS
MAIN OFFICE AND WORKS McKEES ROCKS, PA.
(PITTSBURGH DISTRICT)

CHAPMAN & STEIN AND SURFACE COMBUSTION UNITE THEIR



The introduction of one-way firing four years ago was the first drastic improvement in pit design for a quarter of a century. Mills were still using old regenerative pits, made obsolete by other advances in production methods. One-way firing and controlled atmosphere advantages were immediately recognized and accepted because they filled a great need for more economical and more efficient equipment. Consequently, an ever increasing number of mills are using this modern pit.

OUTSTANDING FEATURES IN SOAKING PITS

Now.....THE CONTROLLED ATMOSPHERE ONE-WAY FIRED PIT

Four years ago the One-Way Fired Pit was introduced by Chapman-Stein. The large number of modern mills so equipped is tangible evidence of the merits of these pits. Over sixty have been installed in the last two years.

The one-way firing design gives definite control of heat distribution. Greater capacity in given space, in fact 100 per cent increase in capacity in the same pit building is not uncommon.

Construction is simplified . . . no reversing valves, checkers or complicated flue systems.

Large savings are realized on first cost and maintenance of both pits and building. In a recent installation over $100,000.00 was saved in building costs alone.

At the same time the One-Way Fired Pit was being introduced by Chapman-Stein, the "controlled atmosphere" principle was being applied to pits by Surface Combustion. This proved to be another big advance in pit practice.

Automatic proportioning of air and fuel is responsible for unusually low fuel consumption in SC design. It has also made possible control of pit atmosphere, reducing scale loss. Actual operating results demonstrate a saving in scale of ONE PER CENT OF INGOT WEIGHT. This feature alone means a tremendous saving over a year of operation.

Surface Combustion's contribution to improved pit practice has therefore proved highly acceptable.

Now—Chapman-Stein and Surface Combustion join their facilities and resources to offer the Steel Industry the SC CONTROLLED ATMOSPHERE ONE-WAY FIRED PIT, combining all of the advantages of both types . . . low fuel consumption . . . minimized scale . . . greater capacity . . . reduced maintenance . . . extreme simplicity of design.

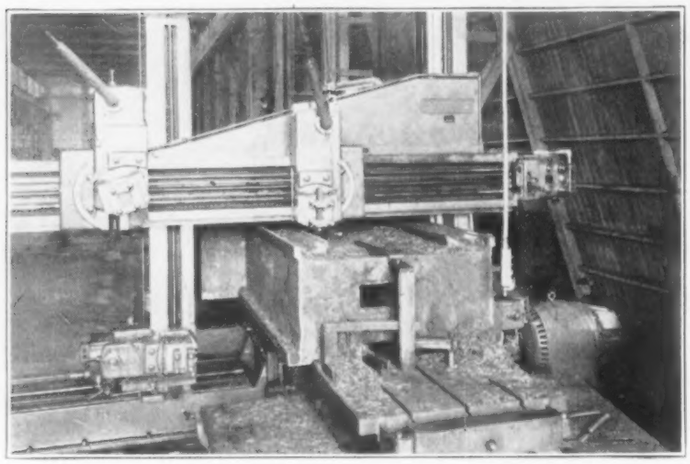
Subsidiary of Henry L. Doherty & Company

Surface Combustion

Surface Combustion Corporation, Toledo, Ohio – Engineering & Sales Service in Principal Cities

A Time Saving of 31%

was effected with an Ultra-Speed Drive

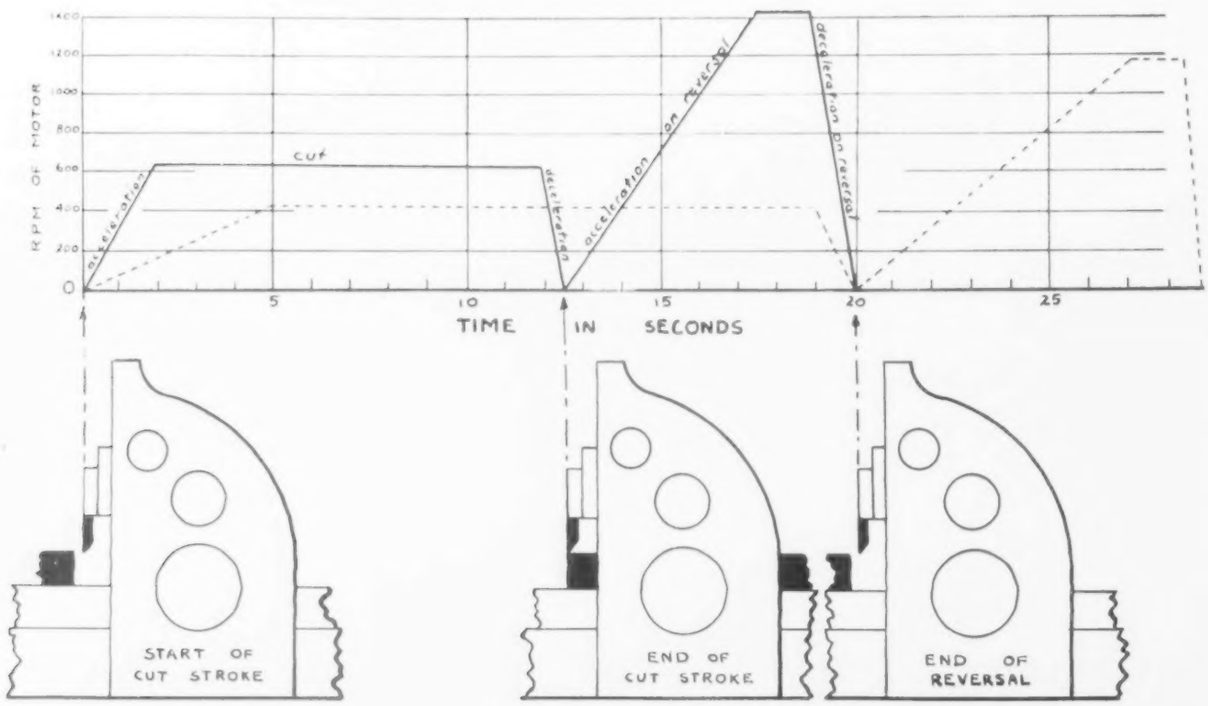


Planer equipped with Ultra-Speed Drive

Diagram shows actual time cycle of *Allis-Chalmers Ultra-Speed Planer Drive* on 60″x60″x15′ double housing planer machining a 5-ton casting 12′ long. The dotted curve indicates the cycle required on the same work by the motor which was discarded in favor of the *Ultra-Speed Drive*. A time saving of 31% was effected!

Now is the time to consider ways and means to improve production and decrease operating costs in preparation for that upward trend in business which is as inevitable as was the decline. Our representative will gladly assist in the study of your particular problem.

Write for Bulletin No. 1139.



ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

Dayton COG-BELT DRIVES

MEET YOUR DEMAND

FOR EFFICIENT POWER TRANSMISSION

...and these drives last longer

...require less space

...they have exclusive advantages found only in Dayton Cog-Belts

Dayton Cog-Belts are die-cut—not moulded—they're accurate and stay accurate. They have a firm, non-slipping grip in pulley grooves. This means that you can accurately gauge speeds to product... obtain required speed ratios and positive control.

There's less wear on bearings. Less tension is necessary.

Less space is required. With Dayton's firmer grip and extreme flexibility, shorter belts and smaller pulleys can be used successfully.

Daytons reduce vibration... machines last longer.

LONGER LIFE... Daytons are rugged. They last longer ... run true... do not twist or turn over in pulley grooves... they resist the action of wear, heat and moisture. There's less expense for replacements.

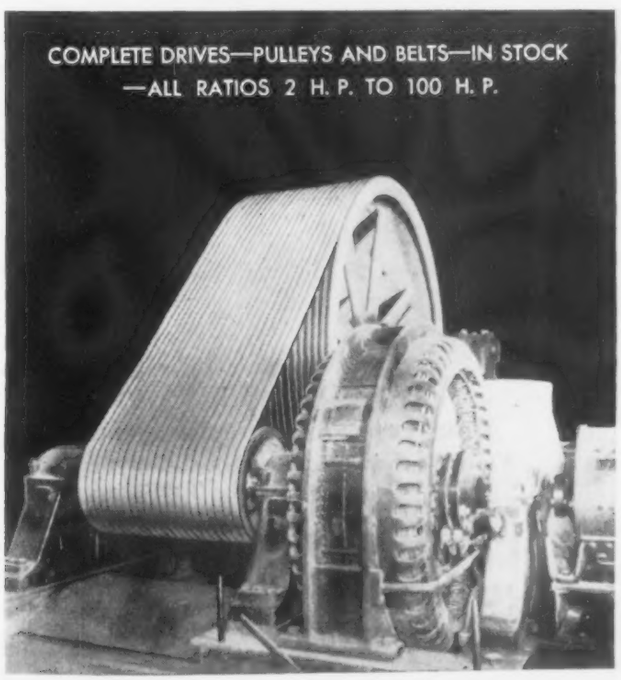
LESS MAINTENANCE... No lubrication is required ... no dressing... no oil or grease to collect dust.

Figure out what all these features will mean to you in savings and increased earnings.

GET ALL THE FACTS... Let us send you complete details. Write for a Dayton Cog-Belt catalog and a section of the belt... today.

THE DAYTON RUBBER MFG. COMPANY
DAYTON, OHIO

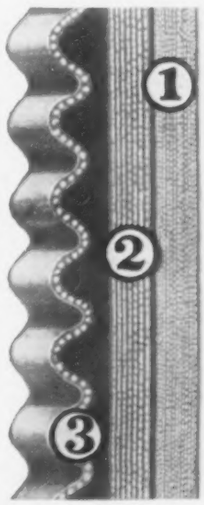
FACTORY DISTRIBUTORS IN PRINCIPAL CITIES AND ALL WESTINGHOUSE ELECTRIC & MFG. COMPANY SALES OFFICES



1 The Outer Section gives balance. Composed of layers of vulcanized, strong cord fabric. Bias-cut to accommodate bending without strain or distortion. This is another reason why Daytons don't heat and last longer than other V-type belts.

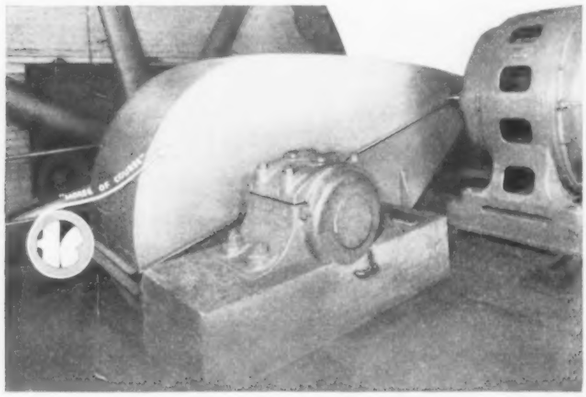
2 The "Neutral axis", or strength section extends across the entire width of the belt. It's pre-stretched permanently by a patented Dayton process. That's why Daytons have a firmer grip, smoother action, eliminate weaving, and require less servicing in take-up adjustments.

3 The Cog Construction permits Daytons to flex naturally and easily around even the smallest pulleys without distortion, buckling or rippling. This is an exclusive Dayton feature... Daytons are "built to bend."



D-128

SAVING MONEY *in Roller Mill* POWER TRANSMISSION



160 and 500 h.p. Morse Silent Chain Drives operate 10 hours a day, without the slightest trouble, on rolling mills of Phoenix Horse Shoe Co.

WHERE the jobs are the hardest, Morse Silent Chain Drives show their ability to give the kind of service that cuts costs for users. Rolling mill power transmission requirements necessitate the use of drives that are positive, flexible, compact and absolutely dependable.

The Phoenix Horse Shoe Co., Joliet, Ill., installed Morse Drives in their rolling mills in 1928, after lengthy and careful investigation. In a recent report on their installation, they said: "Our Morse Drives have operated 10 hours a day without the slightest delay. Rope drives were impractical because they would require large pulleys and long centers to operate efficiently, and take up too much floor space. Gears were given up because of their lack of flexibility. Chain drives alone seemed to meet our requirements."

Why not let us show you the advantages which you may gain by using Morse?

MORSE CHAIN CO., ITHACA, N. Y.

Manufacturers of Morse Silent Chain Drives, Flexible Couplings and Chain Speed Reducers

Branches in Principal Cities.

Visit the Morse Chain Co., exhibit, Booth B—102, American Road Builders Association National Convention, Saint Louis, Jan. 10th—16th.

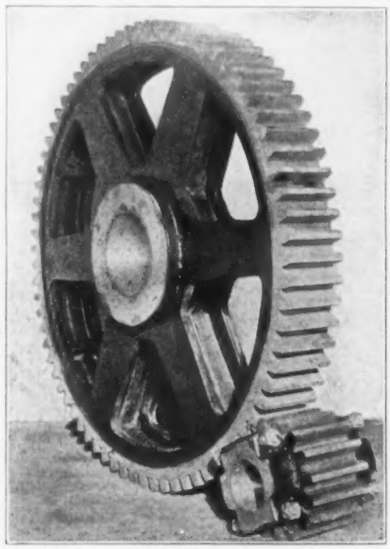


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FOR INCREASED PRODUCTION AND ECONOMICAL TRANSMISSION OF POWER
WHITNEY
SILENT AND ROLLER CHAIN DRIVES
THE WHITNEY MFG. CO. HARTFORD, CONN.

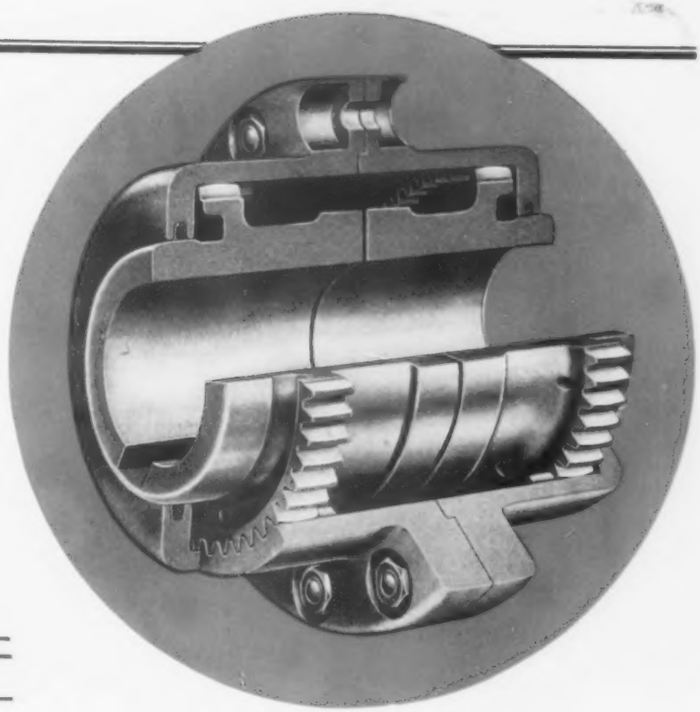
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Hand Made Iron Chain—Ship Cable, Marine Railway Crane, Dredging and Slings

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PHILADELPHIA GEAR WORKS
Manufacturers of Industrial Gears and Speed Reducing Units
Branch Sales and Engineering Offices:
New York, 12 E. 41st St. Pittsburgh, Farmers Bank Bldg.



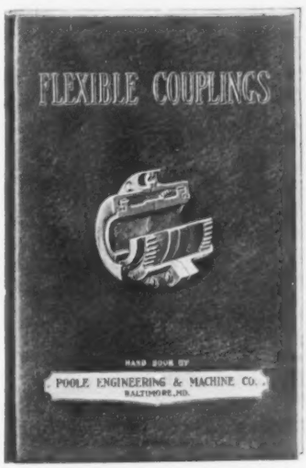
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We make them with the thought of "Service" constantly in mind. That's why every Akron Gear, large or small, gives the kind of service that keeps things going.
Let us quote on your requirements.
The Akron Gear & Engineering Co.
Akron, Ohio



POOLE

can answer your questions with FACTS



Write for our Handbook "FLEXIBLE COUPLINGS"

No doubt, in your plant, as in thousands of others, many questions arise from time to time as to the merit of the various makes of Flexible Couplings. The best way to answer these questions is to get the facts—then decide.

Our new handbook on Flexible Couplings gives you the FACTS about the various types. It shows the features and improvements which distinguish Poole Flexible Couplings from all others, and WHY they are the leaders in their field. These facts should be in the hands of everyone interested in flexible couplings.

This handbook also contains valuable data and information needed in selecting the proper coupling.

Why not start the year right—with FACTS?

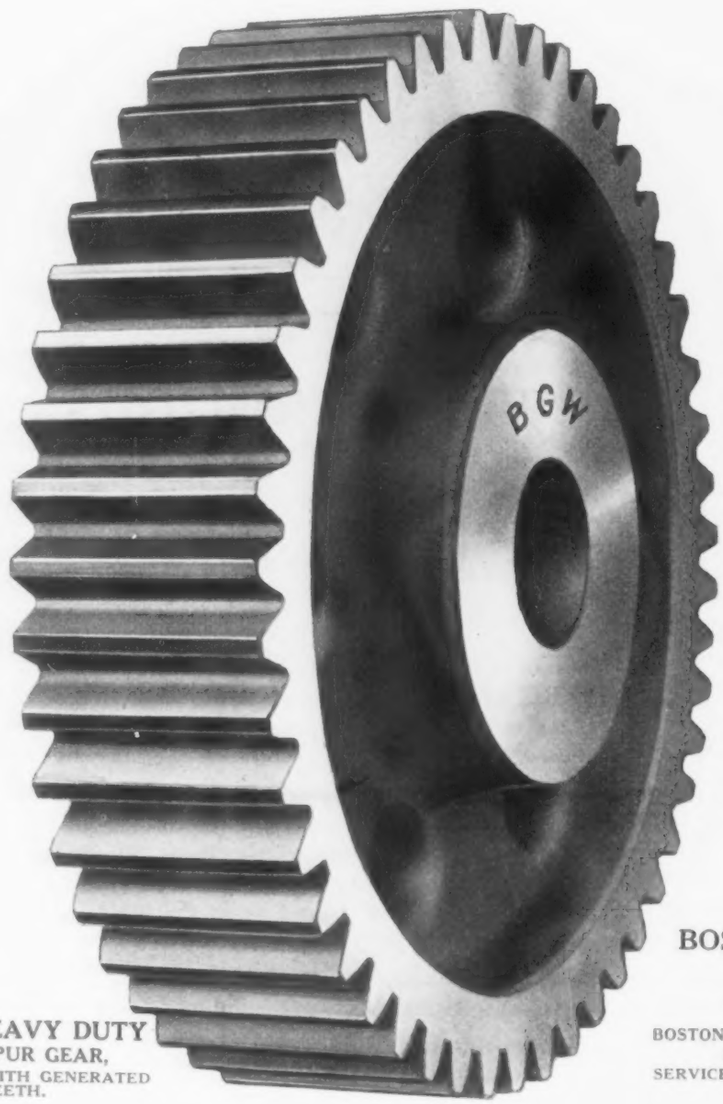
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Baltimore, Maryland

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STRENGTH
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HEAVY DUTY
SPUR GEAR,
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See Our Exhibit at the Fifth Midwestern Engineering and Power Exposition at the Coliseum in Chicago from February 10 to February 14, 1931. Booths 415 to 417.

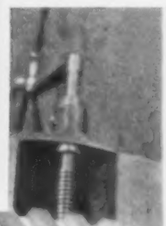
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BOSTON NEW YORK PHILADELPHIA
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FROM COAST TO COAST

BOSTON GEARS

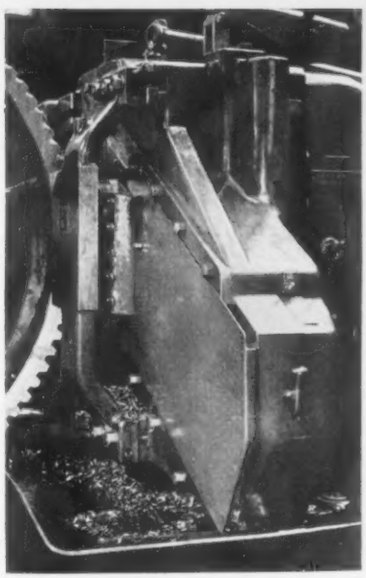
HERRINGBONE GEARS OF MATHEMATICAL ACCURACY



The gears are cut direct by straight sided rack cutters—the simplest, most accurate cutters for generating Herringbone Gears.



During cutting action the gear rotates and the cutters move alternately from the edge of the gear to the center on a straight line at fixed angles.



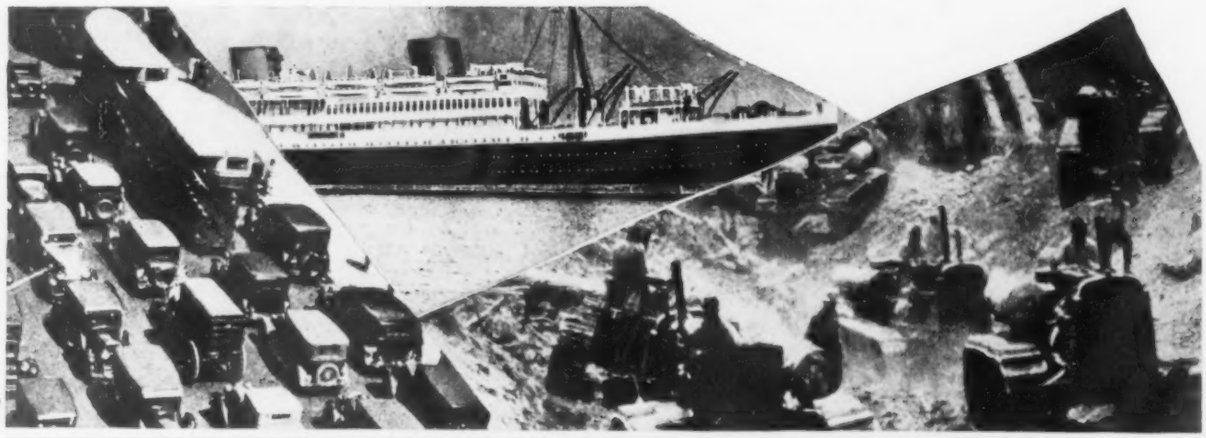
» Here's a close-up of the massive right hand cutter slide showing the fixed angle at which it moves. «

True accuracy—greater strength—perfect mating—at no greater cost—these are the advantages you get in Jones Herringbone Gears. The gears are generated directly by master rack cutters—straight sided tools that can be measured and made with remarkable accuracy. The rack cutters travel in a straight path at fixed angles. All teeth of the gear blank are shaped exactly the same way by the same cutter teeth, so that perfect uniformity is obtained. Because the straight sided rack cutter does not change its tooth form when ground back, all gears produced by the same pair of cutters are exact duplicates. It will pay you to use Jones Herringbone Gears. Send a trial order today.

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Isn't that the type of gear service you want? Let us show you, with estimates, with orders, what we can accomplish on deliveries—how we can cut your costs through quantity production. Just send along your specifications.

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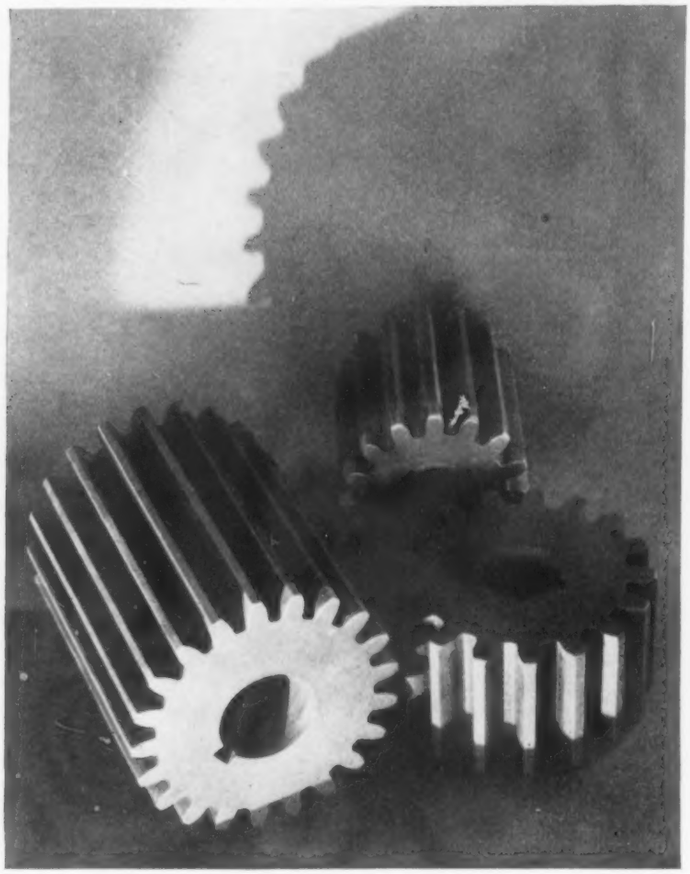
"Gear Problems" is free to any executive or engineer in U.S.A. Fill in below.

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Address_____

1-31

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WHEN a pinion breakdown interrupts your production . . . when every hour means money to you . . . it's worth while to remember that we can—*and do*—give 24-hour service on non-metallic pinion replacements.

In our stock are thousands of blanks of Rawhide, Fabroil, Bakelite and other non-metallic pinion materials, ready to turn and cut to your specifications.

Our 40 years of gear-cutting experience includes the design and production of non-metallic and metallic pinions . . . and metallic gears . . . to fit the requirements of every industry . . . every drive.

The experience and facilities of our organization are at your disposal.

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SPEED REDUCERS AND GEARS

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CUT GEARS CHAIN DRIVES
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Prompt Attention
both to special work and to orders from our Complete Stock of
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GEARS - WORMS - CAMS - MADE TO ORDER
HARTFORD GEARS
THE HARTFORD SPECIAL MACHINERY CO., Hartford, Conn.


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A Moloch Hammer in your shop will be an asset as long as the shop lasts. Guaranteed to give satisfaction, these hammers are real investments in service.
Belt or Motor Drive, made in sizes from 25 lbs. to 500 lbs
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TANKS FOR GASOLINE — OIL — AIR — ETC.
COMPRESSED GAS CYLINDERS
—JOS. A. JANNEY, Jr.—
Successor to
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PHILADELPHIA NEW YORK



GREETINGS!
HAPPY NEW YEAR
Here he is—and welcome. So, what more fitting time to pause and say "hello" to friends!
The past twelve months have been admittedly hectic. And yet, despite conditions, The Leland Electric Company made definite progress in more ways than one during 1930.
General business was better than might have been expected, for which we are truly grateful. Our motors were further improved—are being better made. The line was increased—2 and 3 horsepower units added. The factory was organized for still more efficient production — to render more prompt service.
The Leland Company looks forward with confidence. It predicts a substantially better business year.
And so, as we welcome our mutual friend on the threshold, we greet you also—extend to you our heartiest wishes for a prosperous year.
A. C. REPULSION INDUCTION
D. C. COMPOUND WOUND
A. C. POLYPHASE
ALL IN INTERCHANGEABLE FRAMES

The Leland Electric Co.
Dayton · Ohio · U·S·A
Leland Motors



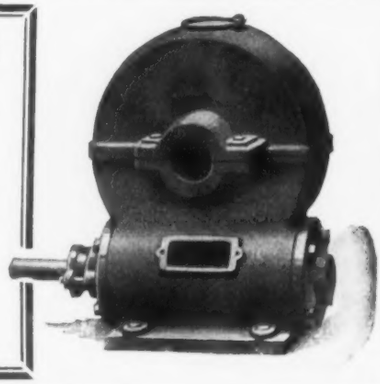
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WATER SOFTENERS and FILTERS
(128 years old—Founded 1802)

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LANCASTER IRON WORKS
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THE MEEHAN BOILER & CONSTRUCTION CO.

STEEL PLATE WORKS

Fabricators and erectors of self-supporting Steel Stacks, Breechings, Piping, Tanks, Chutes, Bins, etc., riveted or welded, for Blast Furnaces, Steel and Power Plants and other Industries.

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LEAD LINED TANKS

Wood or Steel

For Pickling or Storage of Acids.
Sheet Lead Work and Chemical Lead Burning of every description.
Homogeneous Lead Coatings (Gross Formula) for equipment using High Temperature, High Pressure or Vacuum.

GROSS LEAD BURNING & COATING CORP.
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THEY KEEP A-RUNNING



10 Horse Power Century Type SCN Squirrel Cage Induction 3 and 2 Phase 60 Cycle Motor—Across-the-line-Start.

SIMPLICITY OF STARTING

No current-limiting starting equipment is required on Century Type SCN Squirrel Cage Motors in 30 horse power and smaller sizes, because their starting current is within NELA recommendations . . . Any approved switch or starter may be used. As a result, they take full advantage of the line current—no current is dissipated in starting equipment—installation is simplified and maintenance costs are low.

Century Squirrel Cage motors are built in all standard sizes from ¼ to 250 horse power.



Century 250 Horse Power 60 Cycle 440 Volt 1800 R.P.M. 3-Phase Squirrel Cage Induction Motor.

CENTURY ELECTRIC COMPANY
1806 PINE ST. • • ST. LOUIS, MO.
40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof

SINGLE PHASE, THREE PHASE, AND DIRECT CURRENT MOTORS

Century MOTORS

MOTOR GENERATOR SETS, ROTARY CONVERTORS, FANS AND VENTILATORS

FOR MORE THAN 27 YEARS AT ST. LOUIS

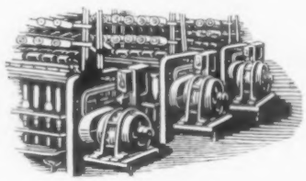
Keep thy Shop and [The Sayings of



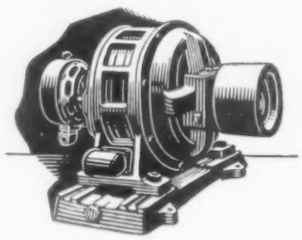
thy Shop will keep thee Poor Richard]

Just Published for 1931 AN Almanack

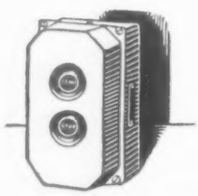
containing wise, thought-provoking suggestions for modernizing industrial plants and published in the firm belief that a penny spent on modernization to-day will be worth ten pennies spent to-morrow.



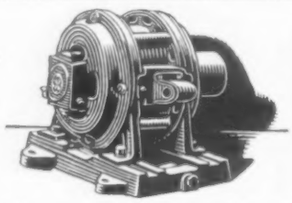
A certain group drive required 164 large bearings and 3600 feet of heavy belting. It was replaced by G-E individual direct-motor drive with 20 small bearings. Maintenance dropped from 65 cents to 12 cents per ton of product.



High power-factor is as beneficial to the plant as to the vendor of electricity. In many cases, the G-E sales engineer can show you how to pay for "leading-power-factor" synchronous motors out of the economies that follow their installation.



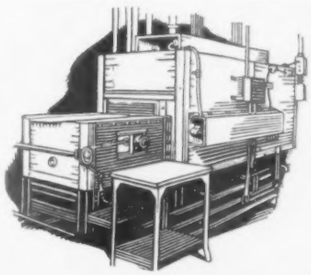
Instead of saying, "I can't use a synchronous motor here because I don't want it to stop at every voltage disturbance," call in the G-E sales engineer and ask him to show you the G-E time-delay devices which keep not only these motors, but all induction motors, on the line for all temporary voltage dips.



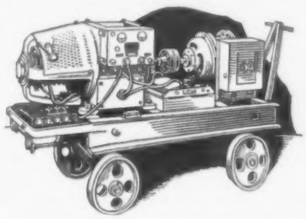
If power conditions in your plant will stand full-voltage starting, there are a number of G-E motors now available for this service that will greatly simplify your control equipment.



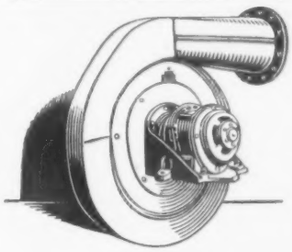
Continued bearing trouble was traced to an uninstructed night man who slapped off the belts by mishandling the starter and kept tightening them up to make them stay on. A G-E magnetic starter would have saved six months of trouble.



A New England manufacturing plant modernized its heat-treating department, at the suggestion of a visiting G-E heating specialist, by replacing four old fuel-fired, batch-type furnaces with a G-E automatic electric conveyor furnace. Handling costs dropped 60 per cent; production was tripled; the products were much improved; and the former high maintenance costs dropped out of the picture.



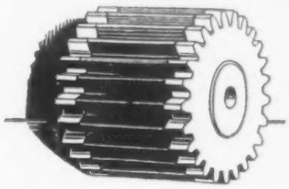
Hundreds of plants are getting "out of the red" and scores of little plants are growing big because they called in the G-E arc-welding specialist to help them modernize their products with arc welding—the greatest of modernization tools. It's almost impossible to strike an arc without improving design or cheating the scrap heap with a neat repair.



No better time to replace those old, inefficient blowers in the forge shop with modern G-E blowers that speed up production by maintaining uniform pressure on each furnace and reduce power costs because they are so efficient. Also, the operation of your cupolas can be greatly improved, and a substantial saving in coke effected, by installing a G-E cupola blower with automatic blast-gate control.



Give your plant engineer some G-E Thyratron or photoelectric tube equipments to play with and you'll be surprised at the number of places where he can use them to speed production, simplify control, and cut costs.



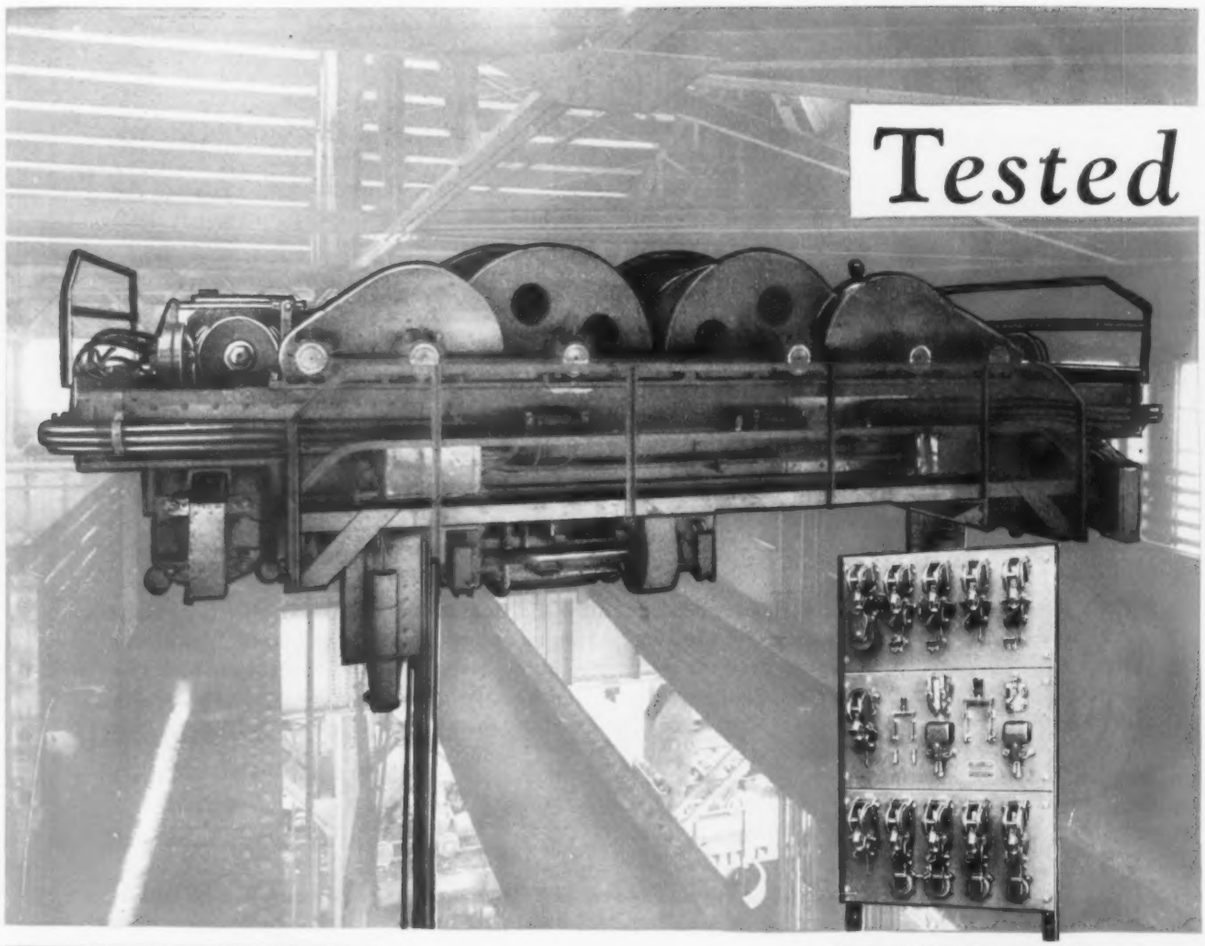
After you've replaced a stripped pinion on a motor shaft a few times, ask the G-E sales engineer to send you a Fabroil or a Textolite pinion. They outlive most other pinions by wide, wide margins. They practically eliminate noise, too.

Modernization Reduces Costs — Increases Profit

There are any number of ways in which the G-E sales engineer can help you to modernize. Ask him about them when he calls; or write the nearest G-E office.

GENERAL ELECTRIC

200-426



C-H Ltl Dynamic Lowering Control used on this Morgan Crane in the plant of a large middle-western steel mill. C-H magnetic brakes also used.



Accessories–an essential for profitable production



Control accessories prevent accidents . . . permit automatic operation . . . save time and steps; they are essential parts of a Control scheme.

Therefore, Cutler-Hammer Engineers have never slighted accessories, instead have developed them equally with C-H Motor Control. C-H Accessories match C-H Control in design, quality of materials, care in manufacture; in ruggedness, dependability and freedom from trouble. There is a C-H Accessory for every need . . . able to contribute its full share toward unbroken production.

C-H

Five Years... Yet *its Advantages show it is* Still New

WITH full and adequate comprehension of the conditions, the requirements, encountered in service by a Dynamic Lowering Control, Cutler-Hammer's Engineers designed its *Ltl* Dynamic Lowering Control to function properly from the start . . . 5 years ago. First of all, there is a difference between acceleration on the hoist, acceleration on the kick-off, and deceleration on the lowering and stop; so, in C-H *Ltl* Dynamic Lowering Control these three functions are kept separate and are adjustable independently of each other.

Decided Advantages of Cutler-Hammer Ltl Dynamic Lowering Controller

(Bulletin 14110)

1 *Automatic time-limit deceleration and graduated dynamic braking for stopping from any speed. Particularly important, otherwise objectionable current-peaks, sparking at commutator and excessive wear on brakes are apt to occur.*

2 *Automatic time-limit acceleration on the kick-off on last point lowering. Insures fast kick-off, instantaneous release of brakes and freedom from excessive current-peaks.*

3 *Automatic time-limit acceleration for hoisting.*

4 *Independent adjustment of acceleration in hoisting and deceleration in lowering. Important because it assures proper hoisting and lowering conditions and makes for greater ease and accuracy in spotting, less inching.*

5 *More accurate speed-control, regardless of load, either on hoisting or lowering—because of better spacing of speed-points, also because of low minimum speed which makes for more accurate spotting without need of so much inching.*

6 *High-speed lowering, providing loaded-hook speed 175% of full-load hoisting speed, light-hook lowering speed from 135% to 170% of full-load hoisting speed—or higher if desired.*

7 *Time-limit acceleration and deceleration are not dependent upon relays or delicate moving parts, assuring dependable action always with less trouble, delay, repairs and expense.*

Secondly, the greatest danger, the greatest risk to equipment, are encountered in the slowdown and stop of a heavy load. Excessive brake wear, sparking at the commutator, heavy stresses and shocks to shafts and keyways, etc., are some of the penalties of improper deceleration. The C-H Control provides *automatic* time limit deceleration and *automatic* graduated dynamic braking . . . keeping current peaks to a safe, easily-commutated value, saving the brakes, assuring smooth handling of the load at all times.

On the kick-off, operator can move his master to the first or an intermediate point or to the last . . . and automatic time limit acceleration assures 100% or more current through the brake, instantaneous freeing of the brake, speedy getaway, safe current peaks —and prevents momentary over-speeding.

Every other advantage you can want is provided by C-H *Ltl* Dynamic Lowering Control: low minimum speed which makes it easy to "spot" without so much inching; high-speed lowering; the maximum amount of service with a minimum of trouble. The simplicity of the board, the absence of relays, are also unique.

Not only has this control had the advantage of *5 years' actual "exposure" to the hardest practical use* . . . but other advantages have been added—as shown to the left. And the same grasp of Industry's needs that permitted C-H Engineers to design this control in the first place, has resulted in constant strengthening, improvement and simplification of it.

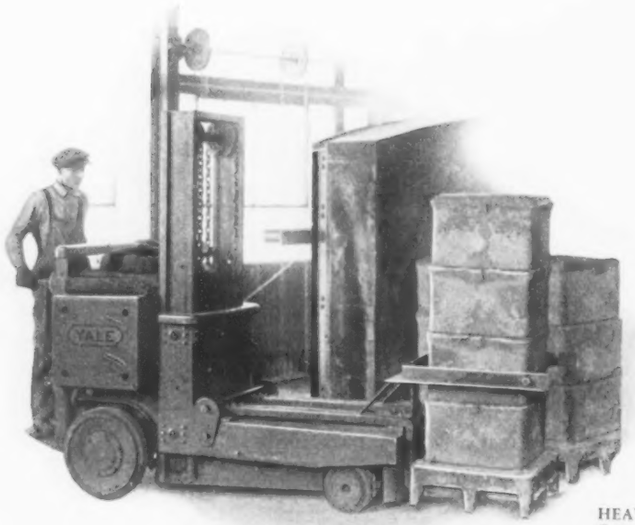
CUTLER-HAMMER, Inc.
Pioneer Manufacturers of Electric Control Apparatus
1260 St. Paul Avenue
MILWAUKEE, WISCONSIN

CUTLER HAMMER

The Control Equipment Good Electric Motors Deserve

A-3926)

SAVE IN *with better*



HEAVY LOADS EASILY HANDLED—*One man and this electric industrial truck powered with reliable Exide-Ironclad Batteries transfer heavy loads easily, speedily, and with economy.*



(*Right*) EXIDE-IRONCLAD *cell cut away to show construction.*



FASTER, QUICKER, MORE ECONOMICAL *handling with electric industrial trucks powered by Exide-Ironclads. That's just the kind of handling these industrial trucks do. And dependable, long-life Exide-Ironclad Batteries furnish the power.*

THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

PRODUCTION COSTS

material handling

Electric Industrial Trucks Equipped with Exide-Ironclad Batteries Save Money

IN the handling of material, industry today has a great opportunity to reduce production costs and increase net profits. This can be accomplished by using electric industrial trucks equipped with Exide-Ironclad Batteries.

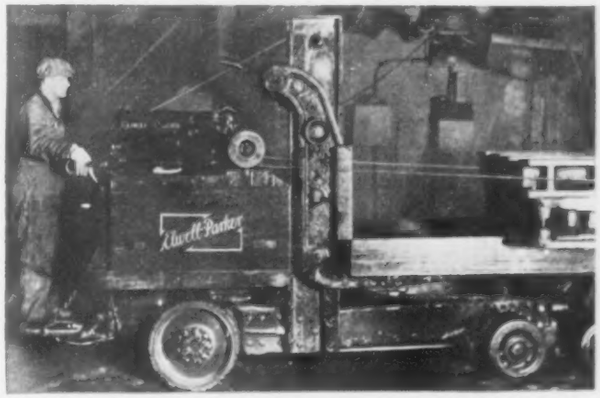
Electric industrial trucks move material with speed, efficiency and economy. When powered with Exide-Ironclad Batteries, they not only maintain a good speed throughout the entire day's operation, but do it at the lowest possible cost.

Exide-Ironclad Batteries are entirely different from all others. Their rugged construction, the result of 43 years of specialized manufacturing experience, enables them to deliver years of day-in and day-out service with minimum care and attention. They are long-lived, powerful, and economical at the charging panel.

Investigate electric industrial trucks and Exide-Ironclad Batteries for your material-handling job. Write for Bulletin 160R.



LARGE OR SMALL LOADS—*Exide-equipped industrial trucks handle them all. This die-handling truck is but one of the many types in which dependable Exide-Ironclad Batteries "do their stuff."*



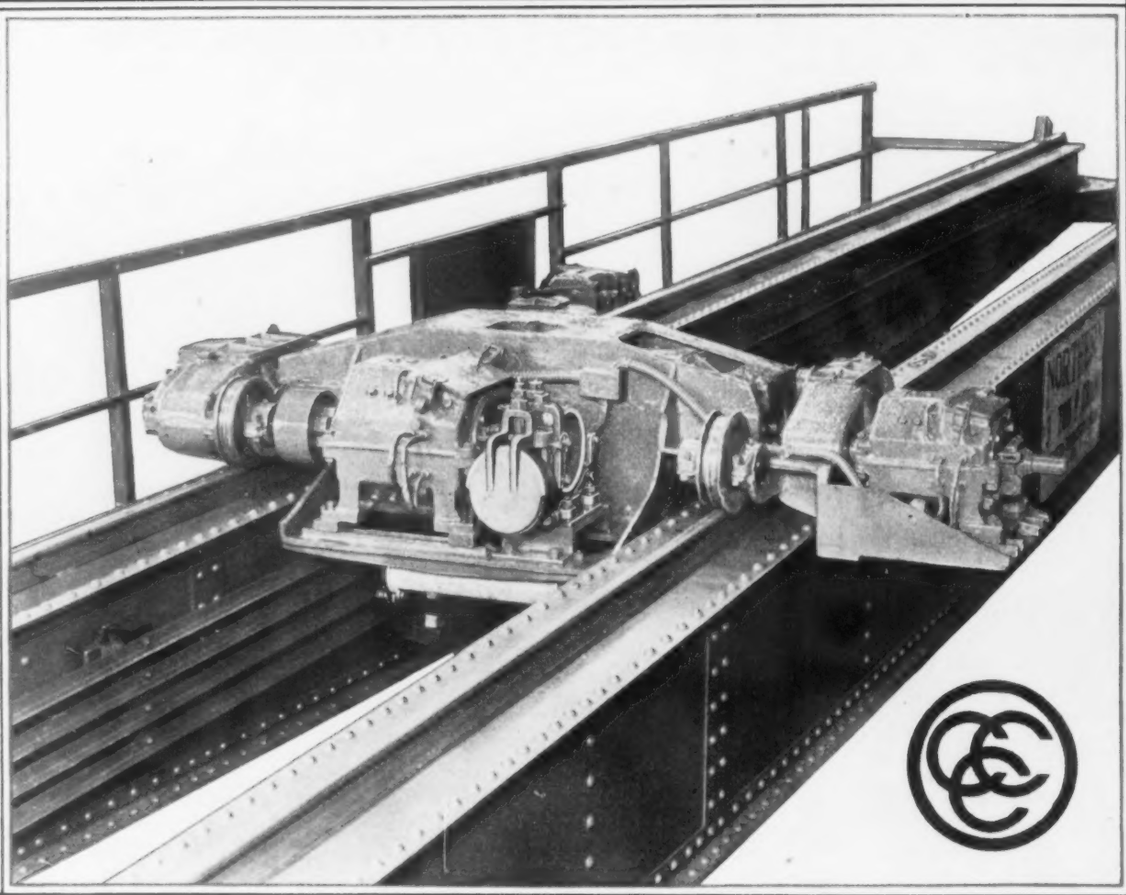
WHEN THE GOING'S ROUGH AND THE JOB TOUGH—*Exide-Ironclads handle materials without a hitch... impart a good speed to the truck and all day long save money for you. This truck is powered by an Exide-Ironclad Battery.*

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

CLARK "3C" BRAKES



OVER THE TOP!

An every day occurrence for

Clark "3C" Brakes

Safe, Sound and Successful in thousands of installations. Standard in many Plants.

Bulletins 102-D and 109-B
Yours for the asking.

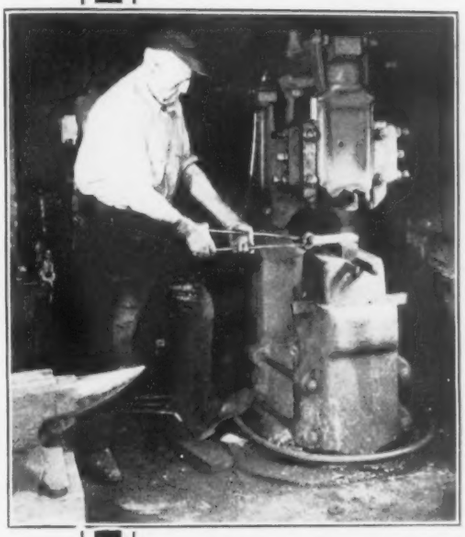
THE CLARK CONTROLLER CO.

• PHILADELPHIA • CANTON, O. • CHICAGO • DETROIT • PITTSBURGH •

Agencies in U. S. A.
BIRMINGHAM CINCINNATI
KANSAS CITY ST. LOUIS

CLEVELAND, O.

Agency in Canada
RAILWAY & POWER ENGINEERING CORPORATION, LIMITED



Your Best Pal—

and

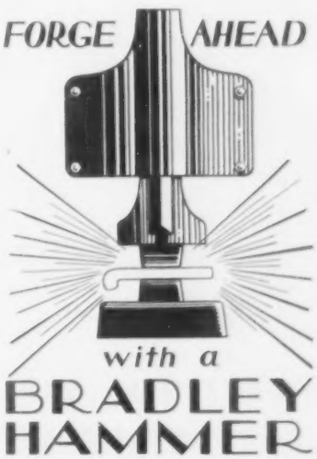
Our Severest Critic

is the Bradley Engineer. Our severest critic because he tests every Bradley Hammer ruthlessly, under actual working conditions.

Your best pal because his rigid inspection guarantees that your most strenuous requirements will be met with complete satisfaction.

Bradley Hammers have been built for nearly 60 years. You will find them in efficient operation in every branch of industry in every part of the world.

Let a Bradley Engineer sit in on your next round table on forging problems. He can help you save money and time.



C. C. BRADLEY & SON, INC.

Syracuse *Established 1832* **New York**

Manufacturers of the Bradley Cushioned Helve Hammer, Bradley Upright Hammer and the Bradley Compact Hammer.

Built in sizes up to 500 lbs. weight of ram.

If you're planning NOW to cut costs in 1931--

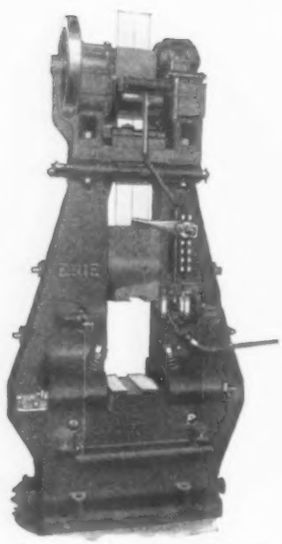
Write us for figures on the savings you can make with ERIE Hammers.

You have probably noted that in a busy forge shop it pays to use *only the sturdiest and most reliable equipment.* The hammer that works with least "nursing" is soon recognized as the most profitable to use.

For example, the general manager of a widely known company (name on request) writes:

"The maintenance foreman and plant superintendent are very enthusiastic about our ERIE Hammer because it has been running with a minimum of expense and trouble."

Experienced forgers know what low maintenance cost means in terms of *increased production* and *lower cost per forging.*



The new ERIE Motor Driven Board Drop Hammer, with all gearing completely enclosed and running in oil; moderate gear speed; gears between sides of the housing, instead of overhung; heavy *ball* bearings; only one big motor, spring cushioned, and driving through double flexible couplings.

ERIE Hammers have improvements that assure unequalled Reliability and Accuracy

The extended box-section frame provides added strength, and maximum bearing area; V-type sow block, seats tighter in the anvil the more blows it receives; positive guide alignment that assures a full-weight blow; new steam-saving valve on ERIE Steam Hammers; improved single-motor drive on ERIE Board Drops, etc.

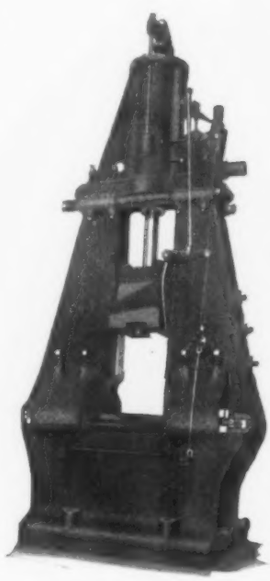
You will find it very profitable to make comparisons. Write us for complete description of the ERIE Hammer that is suited for your work.

ERIE FOUNDRY COMPANY

Erie, Pa.

STEAM DROP HAMMERS—BOARD DROP HAMMERS
SINGLE AND DOUBLE FRAME FORGING HAMMERS
TRIMMING PRESSES—TOOL DRESSING HAMMERS

Indianapolis: 336 Postal Station Bldg.
Chicago: 549 Washington Blvd. Detroit: 335 Curtis Bldg.
Paris, France: 8 Rue de Rocroy.

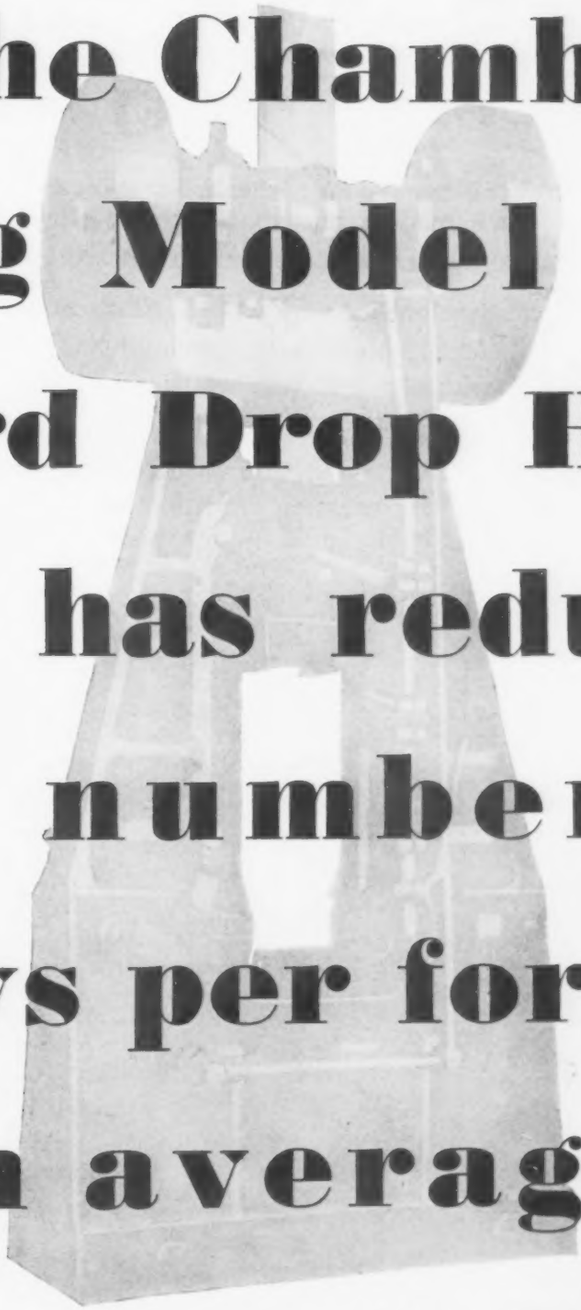


The improved Steam Valve on the ERIE Steam Hammer is just one more instance of the consistent engineering progress which cuts costs for users of ERIES, and assures bigger production.

ERIE

258

. . The Chambersburg Model "H" Board Drop Hammer has reduced the number of blows per forging . . an average of 20% . . .



Ask Any Chambersburg-National Man

CHAMBERSBURG-NATIONAL
COMPLETE FORGING EQUIPMENT

Sales Offices

CHAMBERSBURG, PA. TIFFIN, OHIO

NEW YORK, 152 W. 42nd St. – CHICAGO, 565 W. Washington St.

DETROIT, 2457 Woodward Avenue

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

ACME ALL STEEL FORGING MACHINES

The growing demand for higher and more economical production in modern industry, has placed many older methods and much equipment in the discard.

We have developed a new ACME All-Steel Upsetting and Forging Machine with many new features, combined with those already established by many years of ACME service.

ACME Machines have a sure, powerful grip and a great capacity for pressing work between the dies. Effective relief device gives full protection.

Write for complete details.

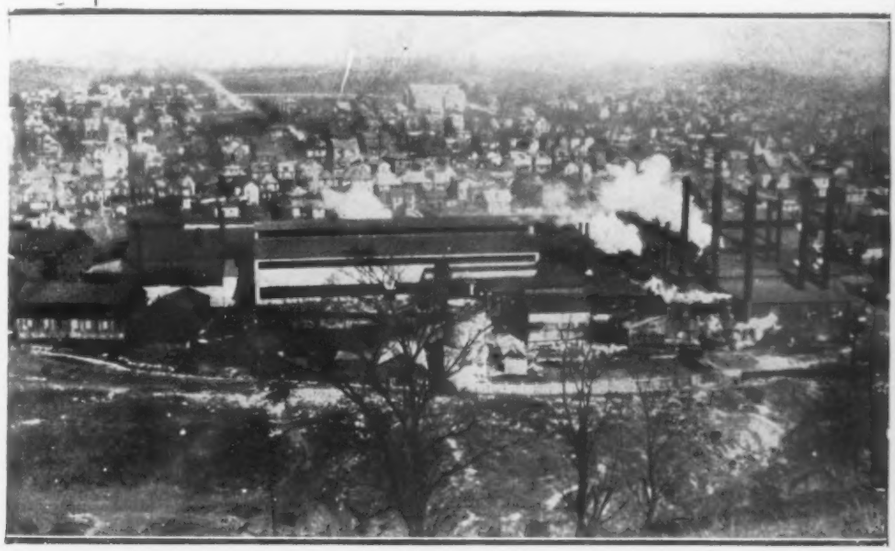


THE ACME MACHINERY COMPANY
COR. ST. CLAIR AND HAMILTON STS. CLEVELAND, OHIO

DETROIT OFFICE: 5185 LORAINE ST.

FOREIGN AGENTS: Burton, Griffiths & Co., London, England; Glaenzer & Perreaud, Paris, France; Ing. Ercole Vaghi, Milan, Italy; Henry W. Peabody & Co., Melbourne, Australia; Isbecque Todd & Co., Brussels, Belgium.

Another User of
HAUSER-STANDER
Pickling Tanks



Cannonsburg Steel & Iron Works, Cannonsburg, Pa.

HAUSER-STANDER Pickling and Acid Storage Tanks are known throughout the iron and steel industry for their good service. Designed to specifications and constructed of Douglas Fir or Long Leaf Yellow Pine, four to twelve inches thick—according to size and service of tank. All tie rods, nuts and washers are of acid-resisting bronze or Monel metal. Lined with lead, rubber or protective wood, according to the requirements. We recommend rubber-lined tanks for Muriatic Acid Storage.

Consult our engineers; we design and manufacture tanks which will meet every individual requirement. Put your pickling problems up to us—no obligation.

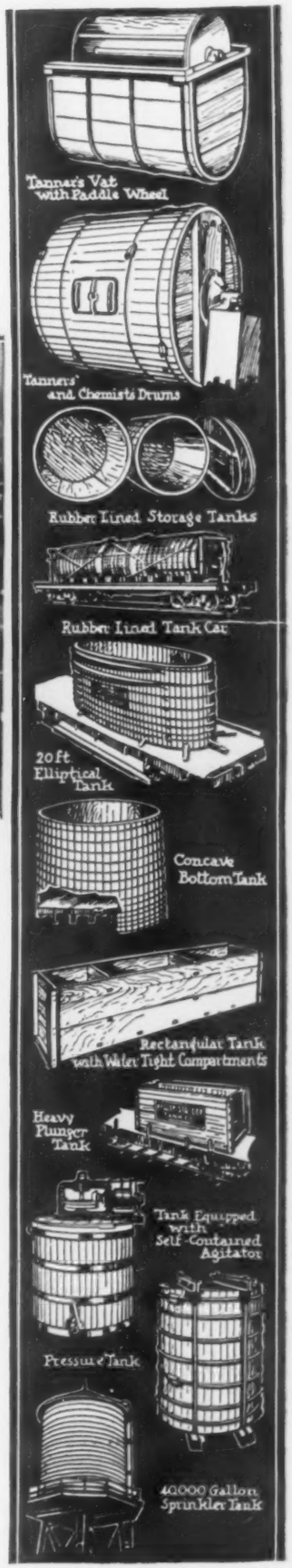
•

"We Win with Quality"

•

The Hauser-Stander Tank Co.

Cincinnati, Ohio



WOOLFORD WOOD TANKS

for

Steel Treating.
Galvanizing and Plating.
Chemical Manufacturing.
Water Storage.



Rear view of factory. Four cars of pickling tanks for one customer.

for

Dye House Equipment.
Food Preparation.
Paper Manufacturing.


Pickling tanks before shipment


Monel lined dye tubs on loading platform


Settling tank for paint manufacturer


Pickling tanks in Tubing plant


30,000 gallon tanks in a filtration plant

AT YOUR SERVICE

EXPERIENCE — Exclusive Wood Tank Manufacturers since 1854.

PLANT EQUIPMENT — Modern electrically operated woodworking machinery — Four-side planers with capacity up to 16″ x 32″ timbers. Re-saws, Multiple Boring Machines, Crozers, Shapers, Automatic Jointers, Sanders, Moulders, Conveyors, Hoists.

MATERIAL — Yellow Pine, Douglas Fir, Red Gulf Cypress, California Redwood, White Cedar, White Pine, Poplar, Spruce.

TRANSPORTATION — Main line Pennsylvania Railroad with private sidings. Five-ton and Thirteen-ton Trucks, specially equipped to handle assembled Tanks for quick delivery.

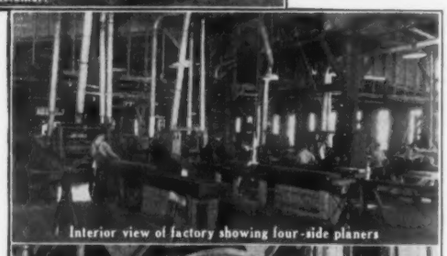
▲

For over Twenty years we have furnished many of America's largest Steel Mills with Pickling Tanks. Throughout these years we have developed and perfected Pickling Tank construction assuring LONGER LIFE.

We have succeeded—
They last longer—
They hold hot or cold acids.

We ask for the opportunity to place our EXCLUSIVE and ADVANCED CONSTRUCTION FEATURES before you.

We ask that you permit us to quote on Your Requirements upon OUR SPECIFICATIONS OF MATERIAL, RODS, AND CONSTRUCTION. Your satisfaction means our greater success as Pickling Tank Builders.


Interior view of factory showing four-side planers


Special settling cone for Chemical company

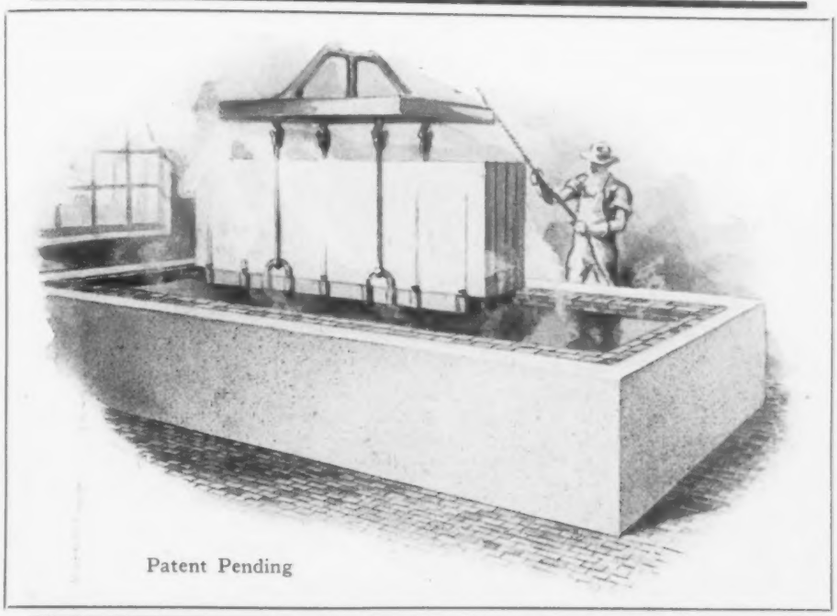

Rubber-lined and two plank-lined pickling tanks


Pickling tanks with exclusive plank lining


486,000 gallon tank for Paper Mill

G. WOOLFORD WOOD TANK MFG. CO.

PHILADELPHIA, PA. OFFICE AND FACTORY, DARBY, PA.



Patent Pending

Practically every important steel company is on our customer list for

BASOLIT

It's the modern, efficient construction for Pickling, Plating, and Storage Tanks.

BASOLIT is positively leak-proof, wear-proof. It withstands hydrochloric, sulphuric, nitric, acetic or lactic acids, hot or cold, in any concentration. Hundreds of tanks of BASOLIT construction have been in service for many years *without one cent for repairs!*

We will gladly furnish specifications, drawings, and instructions on any acid proof tank proposition.

For floors subject to heavy trucking and where resistance to acids is required BASOLIT gives many, many years of cost-free service.

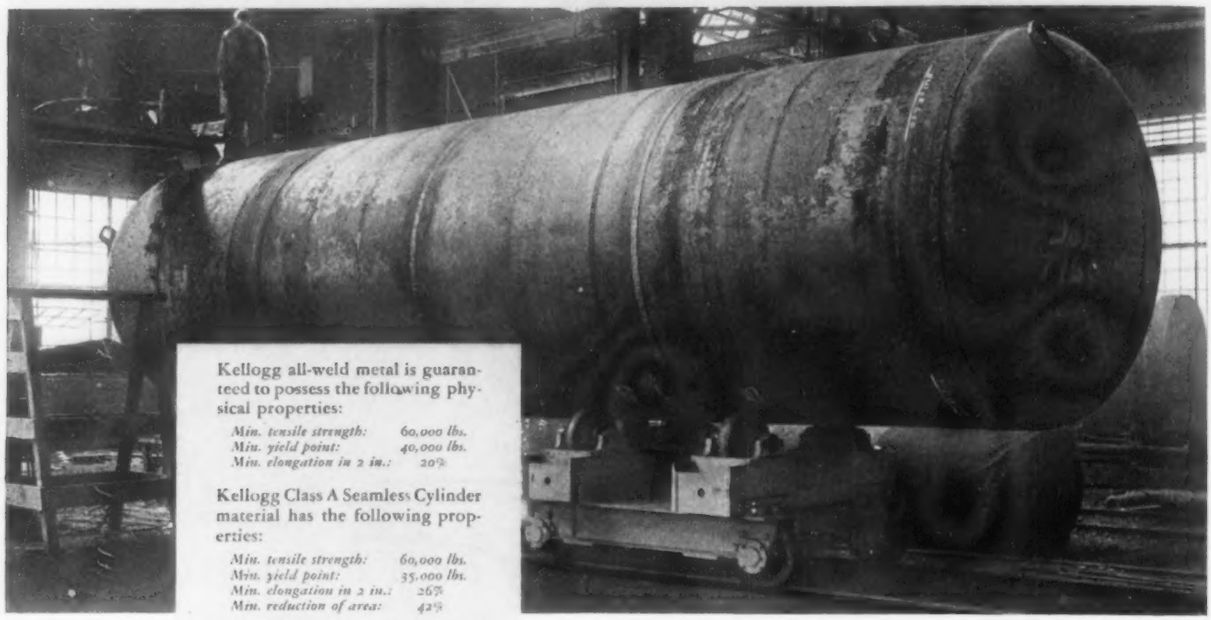
NUKEM PRODUCTS CORPORATION

68 NIAGARA ST.
BUFFALO, N. Y.

New York Office
55 W. 42nd St.

Pittsburgh Office
604 Chamber of Commerce Bldg.

TODAY'S PRESSURE VESSEL HAS TOMORROW'S DURABILITY



Kellogg all-weld metal is guaranteed to possess the following physical properties:

Min. tensile strength:	*60,000 lbs.*
Min. yield point:	*40,000 lbs.*
Min. elongation in 2 in.:	*20%*

Kellogg Class A Seamless Cylinder material has the following properties:

Min. tensile strength:	*60,000 lbs.*
Min. yield point:	*35,000 lbs.*
Min. elongation in 2 in.:	*26%*
Min. reduction of area:	*42%*

Kellogg Special 50% discard welding quality plate has the following properties:

Min. tensile strength:	*55,000 lbs.*
Min. yield point:	*27,500 lbs.*
Min. elongation in 8 in.:	*25%*

A Masterwelded Kellogg Evaporator Tower. 108" I.D. x 2" thick x 34'0" overall. Made from Kellogg Rolled Seamless Cylinders and ellipsoidal spun heads. Sizes of pressure vessels fabricated of Kellogg Seamless Cylinders are limited only by transportation facilities.

Masterwelded of KELLOGG rolled cylinders.....it has no longitudinal seams.....

Strength to insure maximum reliability and safety under operating temperatures and pressures of today is inherent in the Kellogg Masterwelded Pressure Vessel. Vessels Masterwelded of Kellogg Rolled Seamless Cylinders (a distinctive Kellogg product) represent the finest in modern fabrication. They are today's pressure vessels with tomorrow's durability.

Masterwelds have the full tensile strength of the base metal. Both deposited metal and base metal adjacent to the weld possess unusual ductility and density.

These vessels have no longitudinal seams. Fibres of the cylinders always run circumferentially, and the cylinders have the "skin" of rolled steel that is unusually resistant to corrosion.

Write for brochure describing Kellogg Masterwelding of pressure vessels from Kellogg Seamless Cylinders or Plates.

THE M.W. KELLOGG COMPANY
225 BROADWAY NEW YORK, N.Y.

Birmingham, 827 Brown-Marx Building; Boston, 12 Pearl Street; Chicago, 1 La Salle Street; Pittsburgh, Oliver Building; Los Angeles, 742 Western Pacific Building; Tulsa, Philtower Building

DUCTILE

KELLOGG *Masterweld*

TOUGH

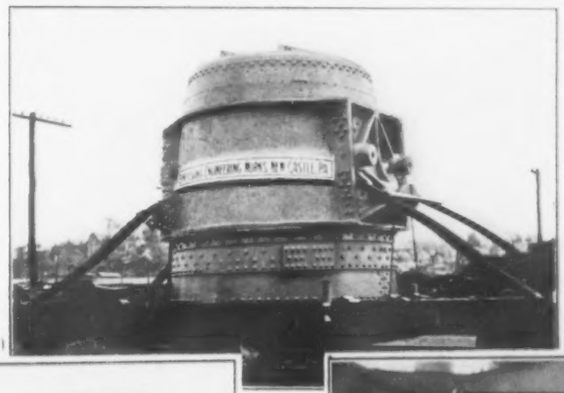
Kellogg Products include Welded Boiler Drums, Receivers, Separators, Headers and Complete Power Plant Piping

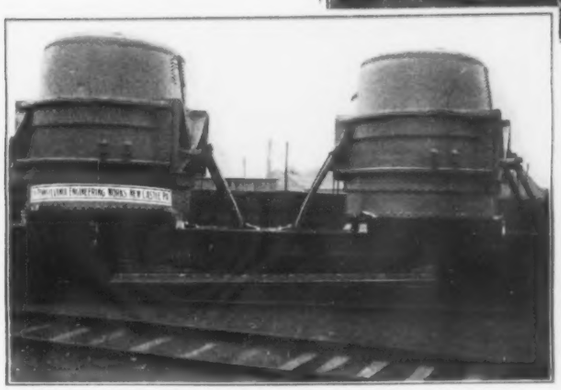
LADLES

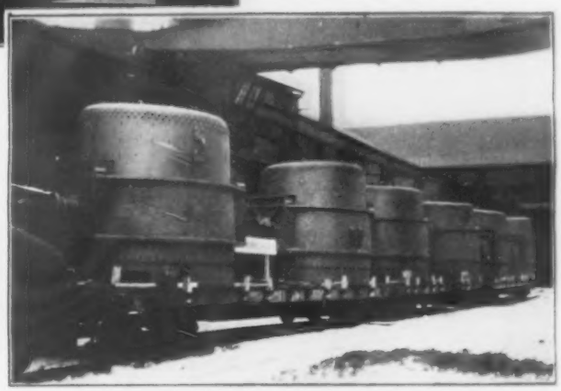
All Sizes and Capacities–Lip, Side or Bottom Pouring

We are builders and designers of Blast Furnaces, Converter Plants, Duplex Plants, Mixers, Tilting Open Hearth Furnaces, Slag Cars and Special Steel Mill Equipment.

Castings, Machine and Plate Work, Iron and Steel Cars.





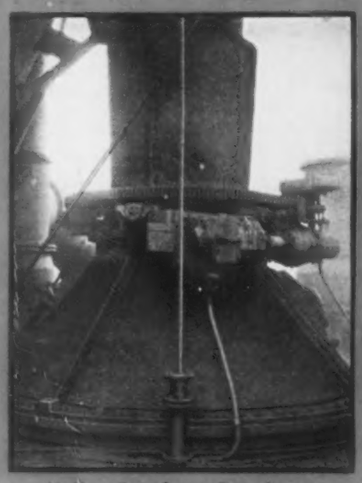


PENNSYLVANIA ENGINEERING WORKS

Engineers and Fabricators

New Castle, Pa.

REHABILITATE

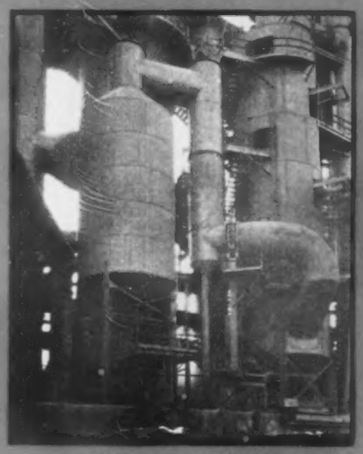


McKee Revolving Distributor

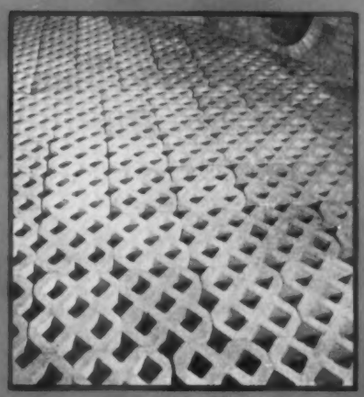


Baker Suspension Type Bins

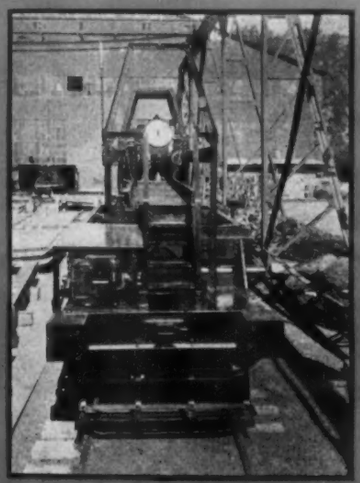
Rehabilitation and modernization of old stacks, stoves, stockhouses, material handling and gas washing equipment and the addition of labor saving and safety devices can be effected now with the minimum investment and will result in increased production at the lowest cost per ton.



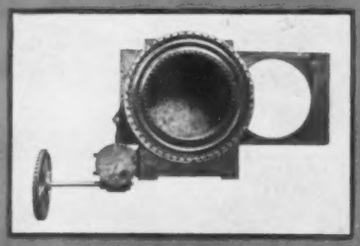
McKee Gas Washer



Nested Tile Checkers for Hot Blast Stoves



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BLAST FURNACES

NOW

A Quarter of a Century of Achievement

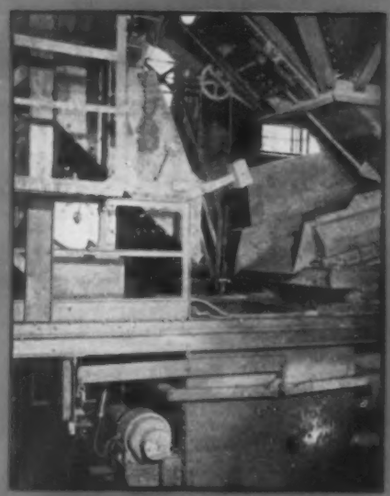
This organization has been designing and building complete Blast Furnaces and accessories for more than twenty-five years. Successful installations are located in all the important steel producing districts in America and foreign countries.

More than a dozen McKee-designed accessories are widely employed for economizing space, enlarging production, lowering costs and increasing safety in operation.

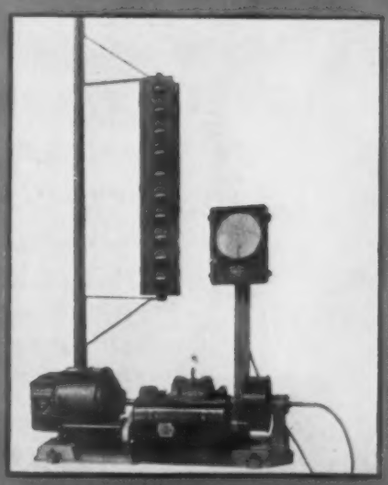
Automatic weighing, accurate charging, full utilization of by-product gases, visible systems of control and record, and many other features conducing to scientific operation have been contributed to the industry by devices designed, patented, manufactured and installed by this company.

Departments for the design and construction of Open Hearth Furnaces, Bessemer Convertors and Soaking Pits have been added to extend the field of operations from Ore to Blooming Mill. Complete layouts or individual units are handled on a single contract, with undivided responsibility.

Reports on operating problems from mine to finished product; fuel surveys to determine the most efficient use and distribution of gases for metallurgical purposes; reports and appraisals for financial purposes; investigation of any problems in the iron, steel or refinery industry are other services which we offer.



Coke Screening and Weighing Equipment



Automatic Test Rod Mechanism

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By
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Now—Rolled in the Central West

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Illinois Steel

Subsidiary of United States

the Central West

C. B. SECTIONS



The Central West now has a source of its own for the production of the popular C. B. SECTIONS, previously manufactured only by Carnegie Steel Company at Pittsburgh. Illinois Steel Company, at South Chicago Works, manufactures a complete series of C.B. SECTIONS. Production facilities for these Sections include a new open hearth plant, soaking pits, rolling mill, and ample storage facilities located adjacent to mills for the production of American Standard structural shapes. Thoroughly modern facilities for preparing and shipping C.B. SECTIONS assure expeditious service.

Company 208 SOUTH LA SALLE STREET, CHICAGO, ILLINOIS

Steel Corporation

SWEET'S GRADE A-1 REINFORCING BARS

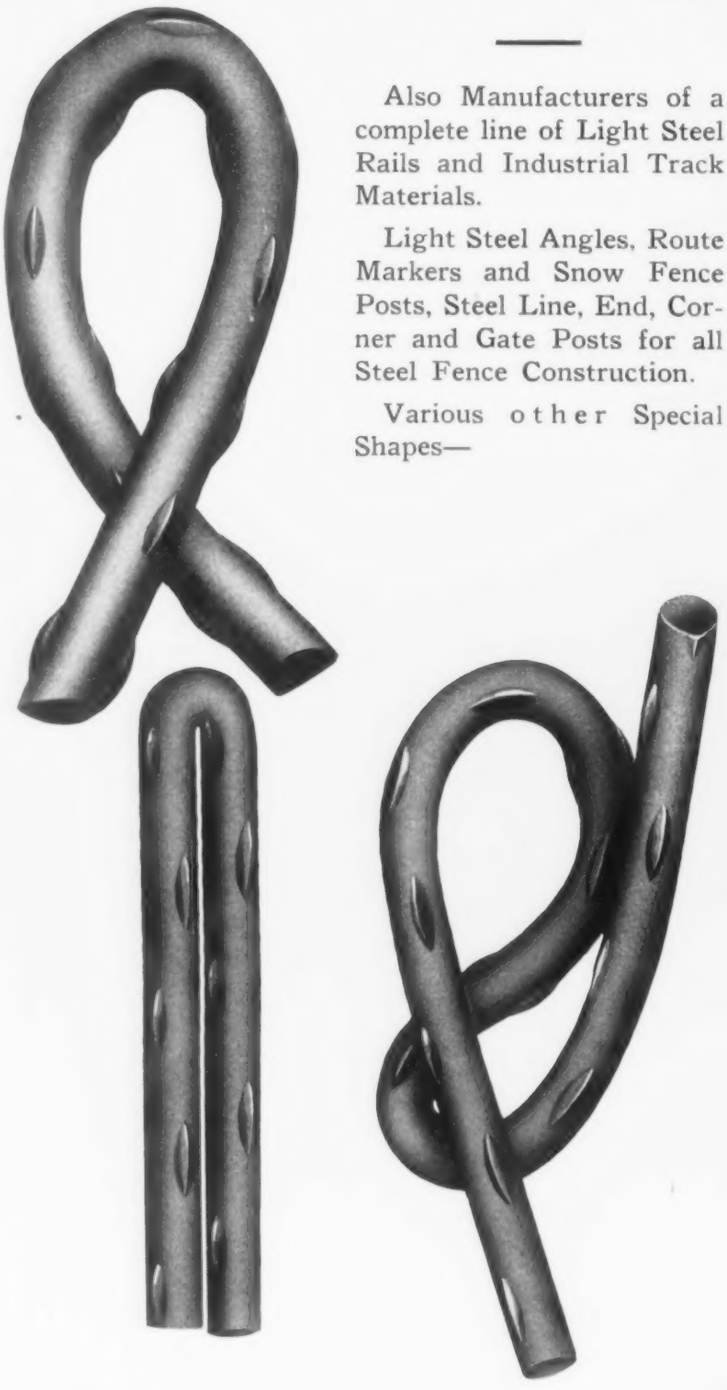
Ductility

This exhibit is evidence of the quality of SWEET'S REINFORCING BARS, and shows the benefits resulting to the Steel through our new process of ROLLING, HEAT-TREATING ANNEALING. These are extreme tests, exceeding by far any practical specifications.

The Bars were first bent or formed to the extreme limits of the most modern forming equipment without showing fracture or failure. They were then subjected to many severe blows of a heavy steam hammer, again without showing failure.

The tests were performed in the Plant of Sweet's Steel Company, under the personal direction of an eminent engineer of tests. Many other tests have been made by prominent engineers, reports of which are available.

Bars involved in these tests were 1", 7/8" and 3/4" Deformed Rounds. Photographs naturally show them somewhat reduced in size.



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GOOD STEEL

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A Vital Feature in the Manufacture of

TIMKEN STEELS

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Timken quality control begins with the raw materials. Nothing is taken for granted. Pig iron must check to Timken standards, and every alloying element must be scientifically tested for purity.

Then come the melting tests. Melting is the key process of alloy steel production. Here the predetermined grade of the steel must be definitely established. Laxity of quality control at this point is fatal to the manufacture of good steel.

It is the aim of Timken technicians not only to keep every heat well within the chemical specification limits, but to get as close as possible to the preferred ideal condition suggested by the customer.

So in Timken testing practice no hard and fast rule is laid down respecting the number of chemical tests to be made in connection with each heat.

Testing ceases only when the responsible technical executive is satisfied that the specifications have been interpreted in the most efficient possible manner. The Timken Steel and Tube Company, Canton, Ohio.

TIMKEN
ALLOY STEELS

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MEANS ACCURATELY DRAWN COLD FINISHED STEELS

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ROUNDS—SQUARES—HEX.

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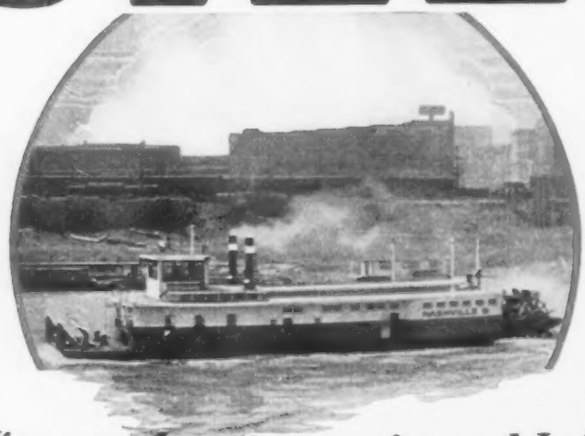
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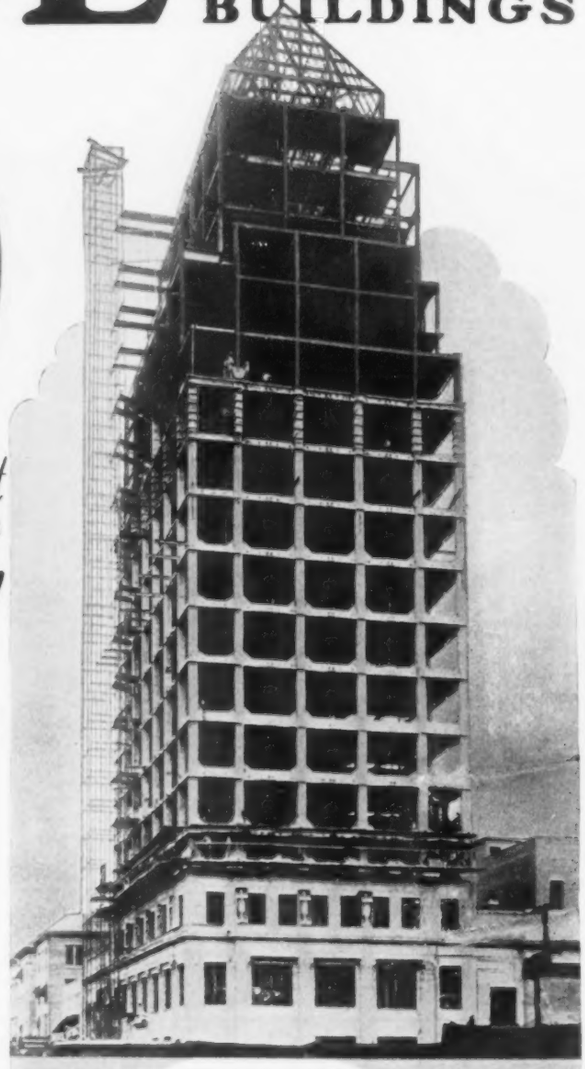
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Associated Alloy Steel Company is an organization devoted exclusively to the sale of corrosion, heat and wear resistant alloys in all forms.

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General Office—1806 Union Trust Building

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In the year 1931 Midvale hopes you will find these tools and materials readily available. And, wherever steel and its alloys fit into Industry's picture, Midvale promises its whole-hearted aid to any industry or any individual toward making the promise of 1931 come true.

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Union Hymo Steel, Union Special Finish, Union Precision Shafting, Union McQuaid-Ehn Steel, Union Supercut Screw Steel.

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WITH plants, sales offices and distributors located in all sections, Union Drawn has developed a network of service channels that covers the country. It employs a staff of field metallurgists that assist customers in the solution of steel and operating problems right on the ground.

The function of this organization is not confined to manufacture. It embraces every aid to American Industry in the utility or fabrication of cold finished steels.

UNION DRAWN STEEL CO.
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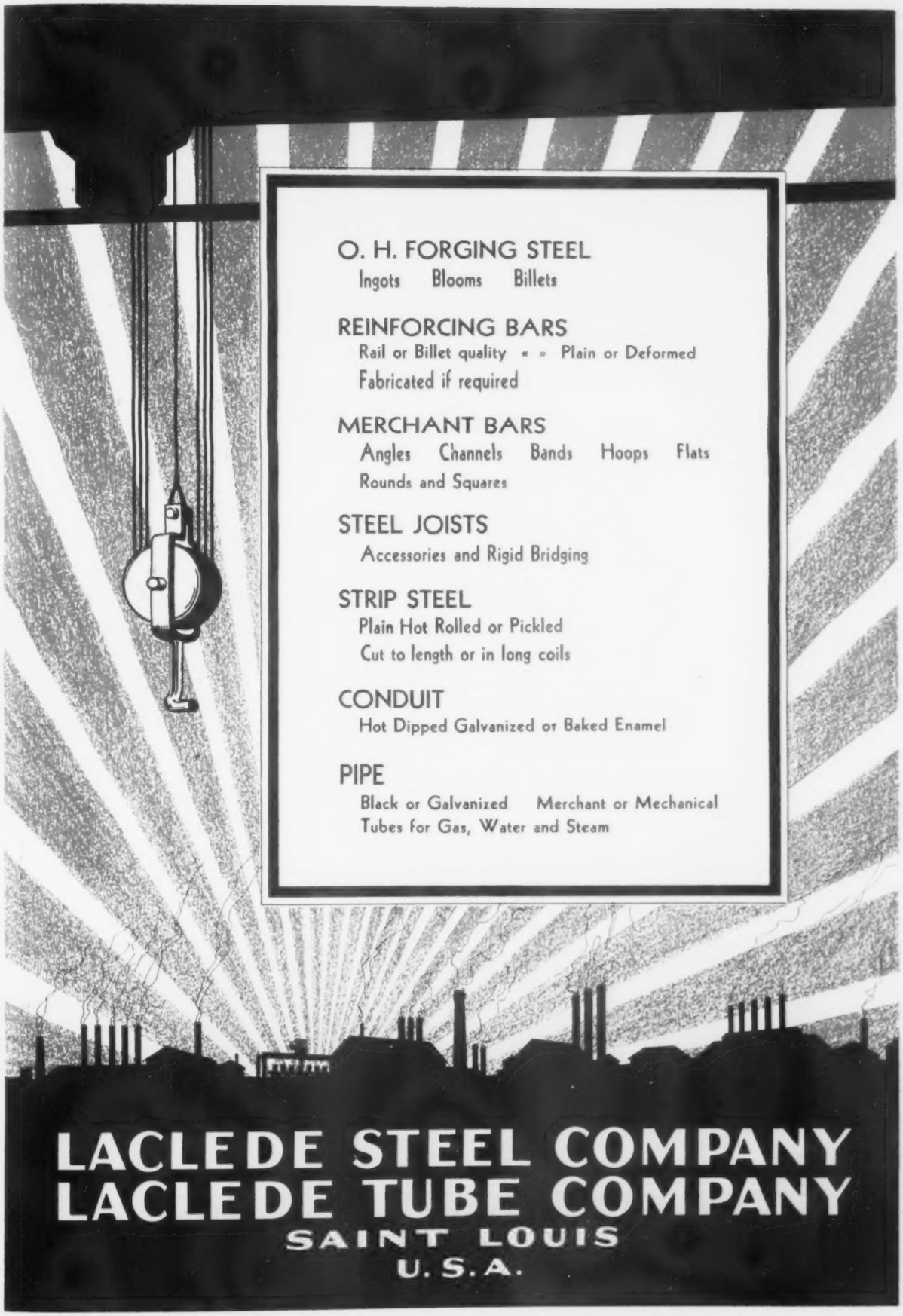
Beaver Falls, Pa., Gary, Ind., Hartford, Conn., Massillon, Ohio, Hamilton, Ont., Canada.

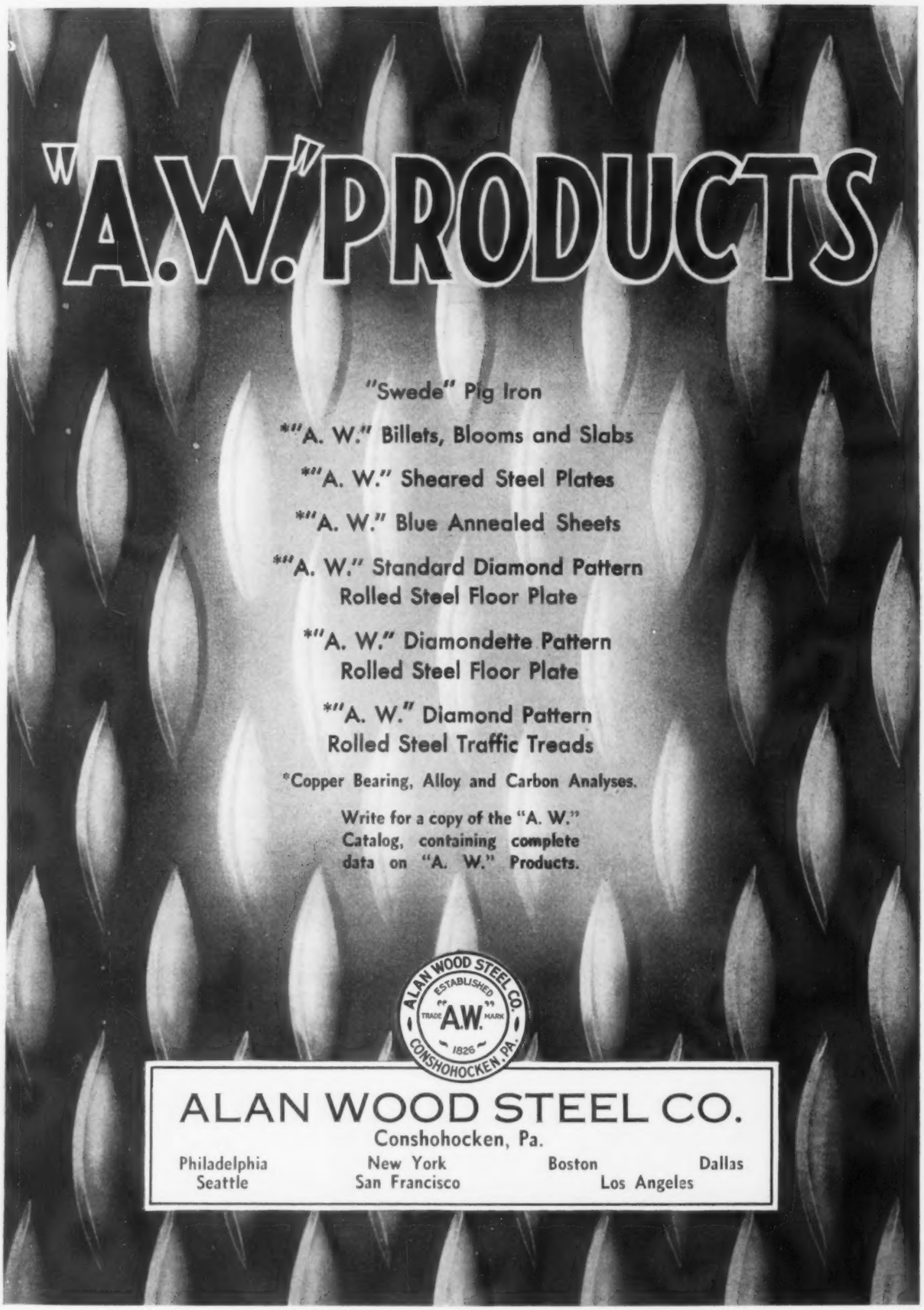
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- TWENTY YEARS AGO it was impossible to say with certainty that the steel you bought was SOUND . . . no matter how important the factor of soundness.
- TODAY, you can be SURE the steel you buy is of the soundness you require it to be.
- YOU can determine this by finding out the process by which the steel was made. The principle employed is either RIGHT or WRONG, and there is no longer any doubt that the term RIGHT means big-end-up practice.
- THE FACT that

"No steel product can be sounder than the ingot from which it is produced"

necessitates the use of a method of producing ingots that assures their quality. The "Gathmann Method" has long been recognized as the *only* means by which sound and reliable ingots can be produced economically.

- THEREFORE, the steel maker employing Gathmann Methods is your only safe source of supply.
- OUR NEW BOOK on ingot contour will interest you as a user of ingot product. Write for your copy — there is no obligation.



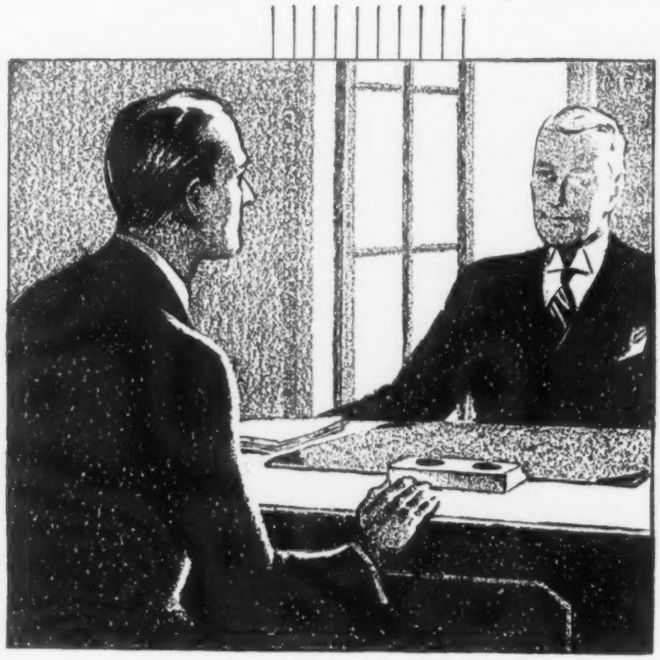
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Designers of INGOT MOLDS

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SOUND COOPERATION ON YOUR "STAINLESS" REQUIREMENTS . . . .

■ When considering the adoption of non-corrosive and non-tarnishing steels of high strength and ductility, in any form, call on Republic. Take advantage of Republic's long experience in the production of stainless alloys and in adopting them to all industrial requirements.

■ Whether your problem involves fabrication, welding, high temperatures or severe corrosion, Republic engineers will be glad to work with you.

■ ENDURO NIROSTA KA2, the perfected stainless steel, processed according to patented Krupp specifications, is available for immediate delivery in all shapes and forms.

Central Alloy Division

REPUBLIC STEEL
CORPORATION

Massillon, Ohio

ENDURO
NIROSTA KA2
the perfected stainless steel

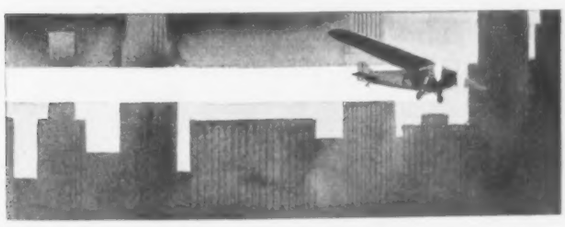


THIS ·· THE STEEL AGE

THE graceful arch of a bridge fades into the mists of the far shore. A mammoth building climbs upward . . . forty, fifty, sixty, eighty-five floors. The streets are a mad rush of motor traffic. Under the streets hundreds of trains rocket through an intricate maze of tracks and tubes. All about is the clatter and hum of machinery—the incredible machinery of mass production. The air vibrates with the drone of an aeroplane.

It is the age of Steel. It is Steel that forms the gigantic span of the Kill van Kull Bridge. It is Steel that carries the Empire State Building to the tip of the 200′ mooring mast atop its eighty-five floors. It is Steel that builds the automobile—that bores roadways beneath the earth's surface. The machine is made of Steel and uses Steel as its fodder. Steel has aided man in his conquest of the air. Every phase of human activity owes its progress to Steel, the basic factor of modern civilization.

Inseparably linked with the development of Steel is the name "Carnegie". For nearly three-quarters of a century, Carnegie Steel Company has engaged in the manufacture of Steel. The knowledge accumulated during this time and the extensive mechanical, metallurgical and engineering resources of this company are yours to summon.

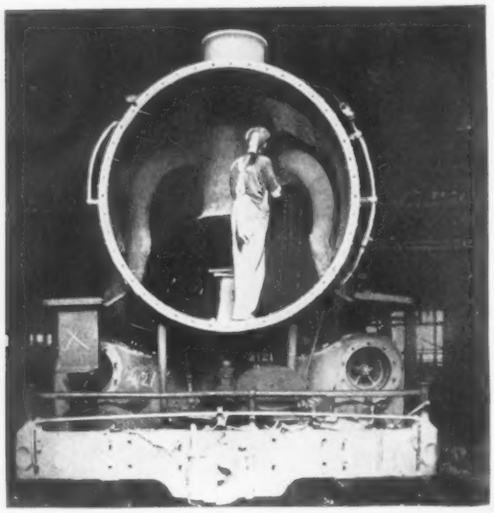


CARNEGIE STEEL

108

CARNEGIE STEEL COMPANY, PITTSBURGH, PA. · *Subsidiary of* UNITED STATES STEEL CORPORATION

BOILER TUBES

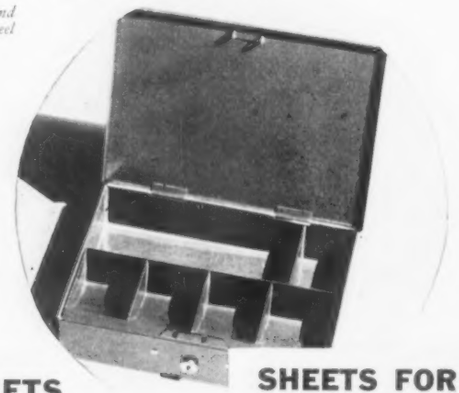


FOR STATIONARY, *locomotive and marine boilers . . . made of open hearth steel . . . sizes 2" to 6" outside diameter.*

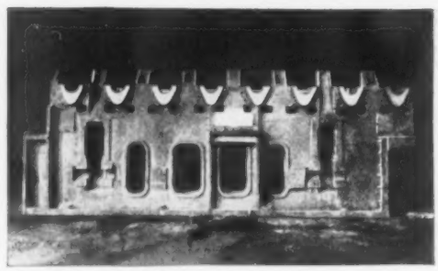
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Many manufacturers have already found that Metals by Allegheny greatly improve their products . . . HAVE YOU?

Allegheny METAL



STEEL CASTINGS



FROM 25 POUNDS *to* 25 TONS *capacity . . . made of acid, open hearth steel, to any specifications.*

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SIZES UP TO *the largest ever used . . . large sales to biggest users . . . uniform high quality . . . twenty-five years' experience.*

SHEETS FOR DEEP DRAWING

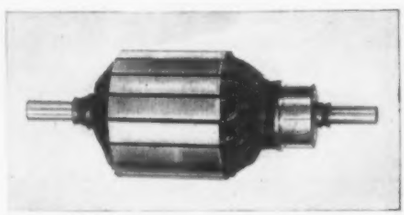
FULL RANGE *of sizes and gauges . . . for deep drawing and stamping operations . . . in standard finish and cold rolled sheets.*

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ROLLING LARGEST SHEETS... *known for better surface and flatness.*

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WORLD'S LARGEST MANUFACTURER . . . 30 *years' experience . . . users include largest electrical manufacturers.*

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REPRESENTED HERE?

THE ten uses of Allegheny Products shown here are but a few of the thousands of applications of these products.

Some Allegheny Products are noted for their resistance to high heat. Some for their resistance to corrosion. Others for their extreme ease of fabrication. Still others for their great tensile strength.

You probably can use one or more Allegheny Products to your advantage . . . to the advantage of your customers.

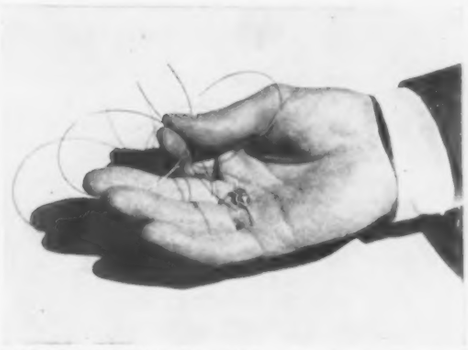
It will pay you to look into the possibilities of Allegheny Products. Find out which one of these Allegheny Products —the steels or the alloys—you can use to the best advantage.

Write, wire or phone us today. Ask to have an Allegheny engineer call. He has interesting facts to tell you.

ALLEGHENY STEEL COMPANY

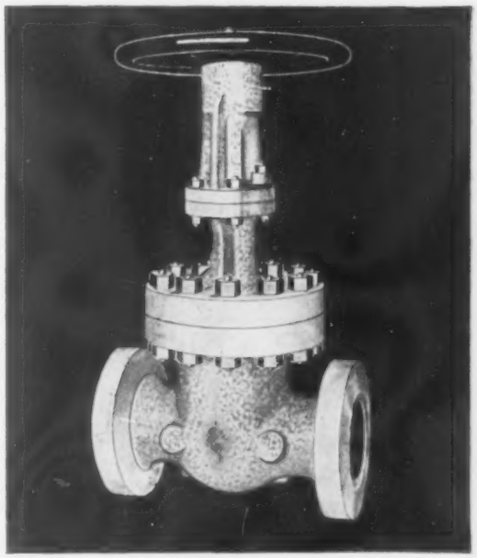
Brackenridge, Pa. . . . *Offices:* New York, Buffalo, Chicago, Cleveland, Detroit, St. Louis, Milwaukee, Los Angeles. *Warehouse Stocks:* Joseph T. Ryerson & Son, Inc.—Chicago, Cleveland, Milwaukee, St. Louis, Cincinnati, Detroit, Buffalo, Boston, Jersey City, Philadelphia. In Canada: Samuel & Benjamin, Ltd., Toronto.

ALLEGHENY METAL



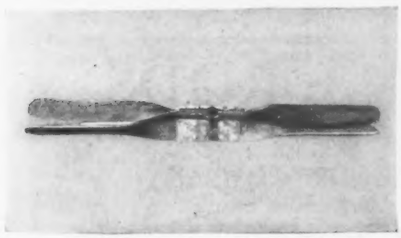
EVERY CONCEIVABLE USE . . . *from hypodermic needles to skyscrapers. Unrusting, unstaining, untarnishing . . . far stronger than mild steel. Tubing and hypodermic needle in man's hand are .020 inch O.D. and .012 inch I.D. (Allegheny Metal is licensed by the Chemical Foundation, Inc., under basic patents No. 1,316,817 and No. 1,339,378.)*

ASCOLOY 33



RESISTS PROGRESSIVE CORROSION . . . *where surface discoloration does not matter . . . easy to fabricate.*

ASCOLOY 55



FOR EXTREME HEAT RESISTANCE (*to 2150 degrees F.*) . . . *resists many corrosive agents . . . not recommended for difficult fabrication.*

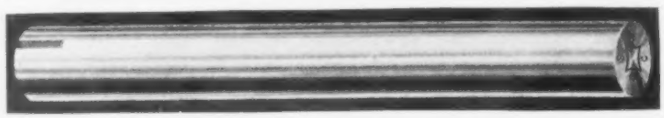
ASCOLOY 44



WITHSTANDS HEAT UP TO 2100 *degrees Fahrenheit . . . stronger than mild steel . . . doesn't carbonize readily . . . easy to fabricate . . . resists corrosion.*

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TURNED *and* GROUND SHAFTS
"Ground to Micrometer Accuracy"



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ALSO HIGH SPEED STAINLESS & CARBON TOOL STEELS
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"DARWIN" QUALITY
The ultimate in the evolution of
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Non-Deforming, Oil-Hardening "NEOR"
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which can also be used in the form of
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MANGANESE STEEL
ROLLED and FORGED PRODUCTS
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SPECIAL ANALYSIS STEEL
SEE OUR REGULAR ANNOUNCEMENT EVERY 4th WEEK ON LAST INSIDE PAGE
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QUALITY - ACCURACY - UNIFORMITY
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MANUFACTURERS OF OPEN HEARTH
Structural Steel Shapes, Beams, Channels, Angles and Ship Shapes

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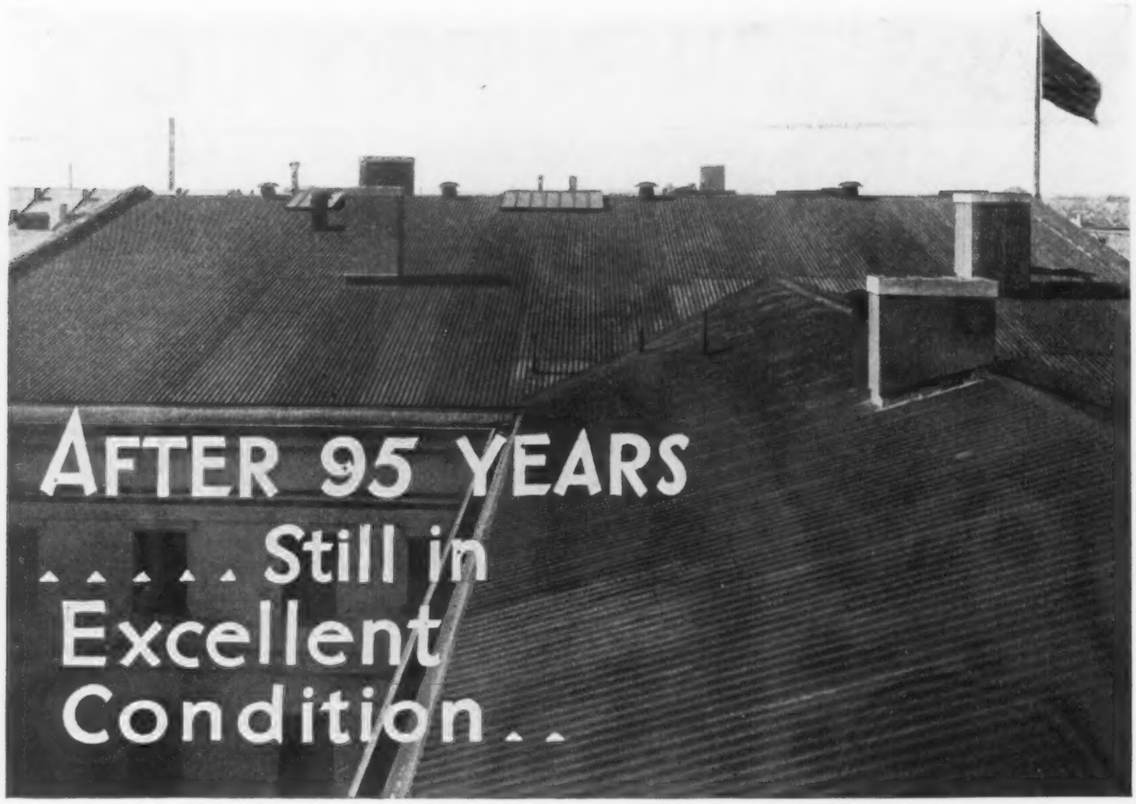
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Engineers, Fabricators and Erectors
CAPACITY 60,000 TONS

Bridges and Other Structures of Steel
Works and Engineering Offices: Phoenixville, Pa.



AFTER 95 YEARS . . . . . Still in Excellent Condition . .

(1) Close up of the old roof on the United States Mint at New Orleans, La. (2) Background shows how the old roof is constantly subjected to smoke fumes from passing boats and from adjacent freight yards.

The United States Mint in New Orleans was built in the old Creole days on the site of old Fort San Carlos, from whose parapet General Andrew Jackson reviewed an army of the New Republic.

This old fortress was dismantled and the mint was erected in 1835.

Mr. Leonard Magruder, assayer in charge of the mint since 1881, writes as follows:

> "The roof was of 20 gauge corrugated galvanized wrought iron sheets and has never been replaced; of course it has been repaired, but not on account of corrosion or rust but due rather to where it had blown off. Will state that the roof has been painted on an average of every fifteen years."

The ventilators noticeable in the above picture are part of the original equipment but are made from uncoated black wrought iron sheets.

The conditions to which the roof has been exposed would not be considered favorable for any sheet metal. The mint is located near the Mississippi River, is exposed to heat, to fog, and mist; is smudged with smoke from steam boats and is blackened by soot and fumes from the numerous trains in the neighboring railroad yards.

For more than 95 years this genuine wrought iron roof has proven its uniform quality by real measurement of value—*Satisfactory results.*





(3) Exterior view of the mint.

AND NOW—

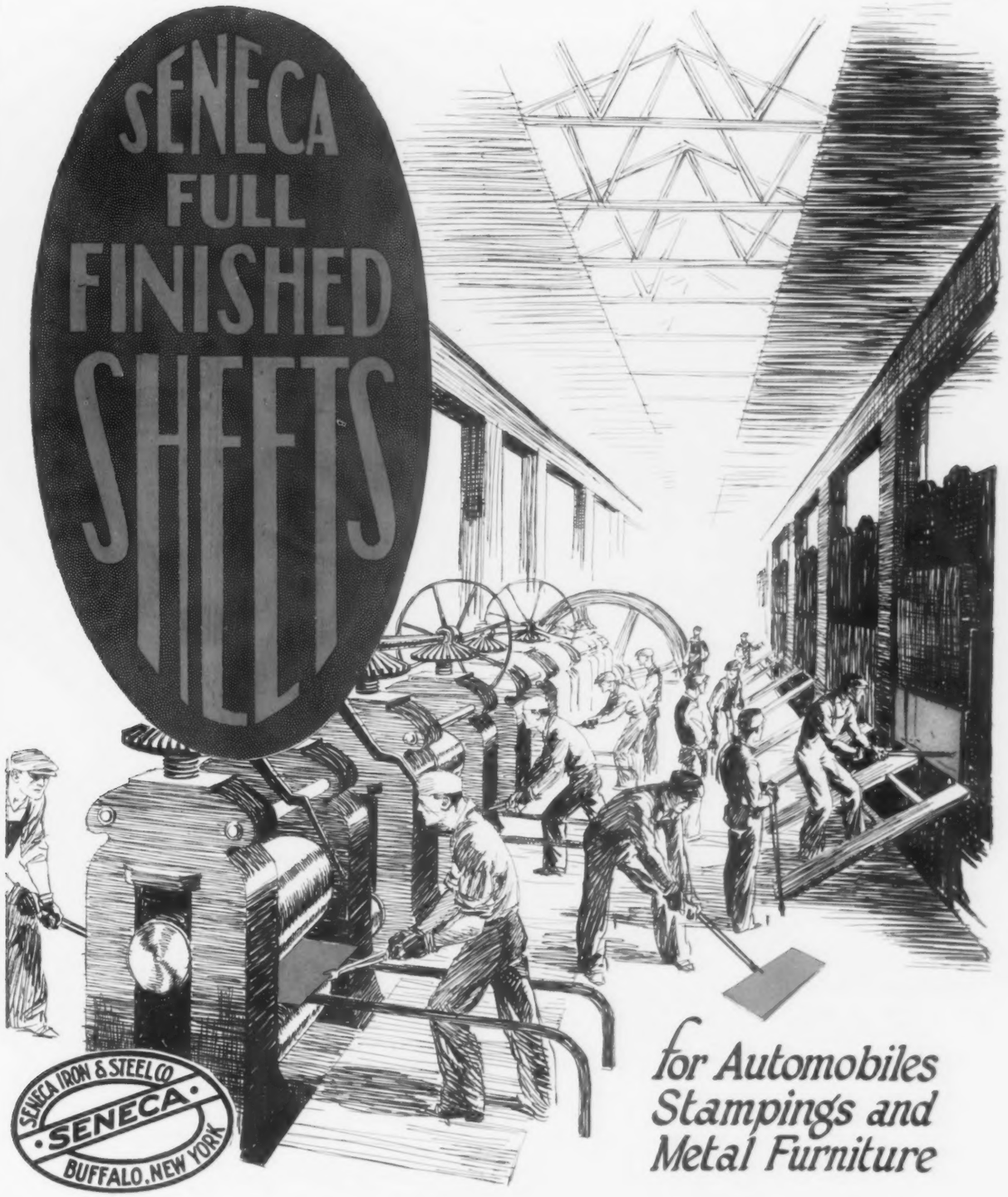
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sheet metal

Sharon's latest product gives you the same resistance against corrosion and long wearing qualities at a cost comparing favorably with that of less durable substitutes. This development marks a new epoch in the sheet metal industry.

Your request for further information will be given prompt attention.

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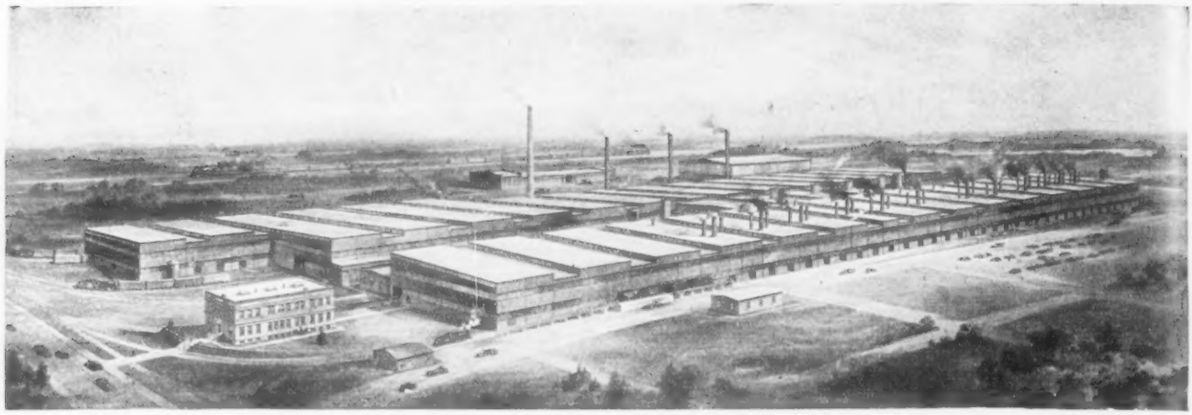
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for difficult stamping operations

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EASTERN STEEL NORMITE SHEETS

The **EASTERN ROLLING MILL COMPANY**
BALTIMORE MD.

Our THREE BRANDS
Known throughout the World



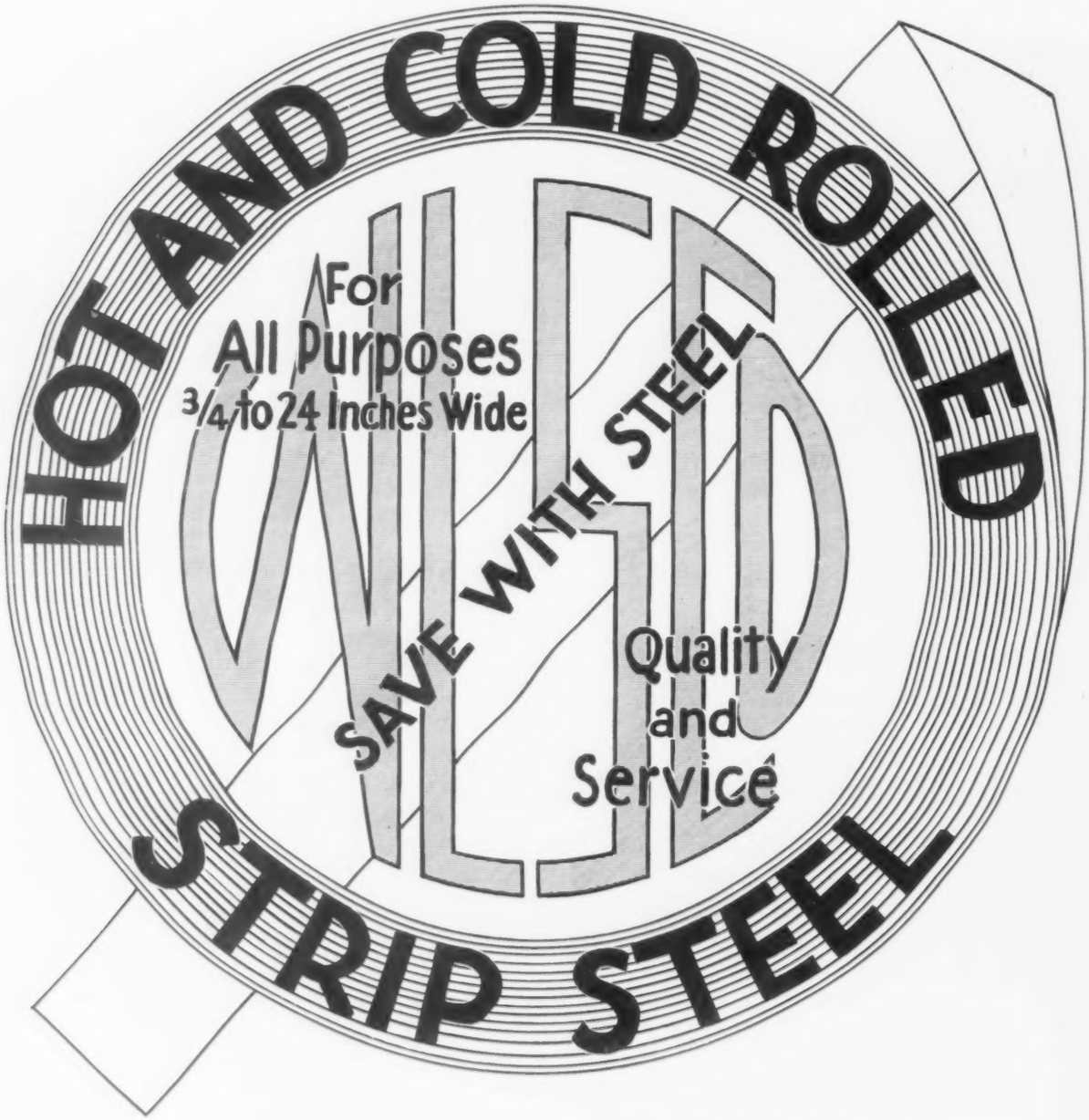
Over forty years of service in a diversified list of products, these three brands have successfully met many individual manufacturing problems—they are known and used throughout American and foreign industries.

Our Products

ONE PASS COLD ROLLED BOX ANNEALED STEEL SHEETS . . FULL COLD ROLLED AND REANNEALED STEEL SHEETS . . SINGLE PICKLED BLUED STOVE PIPE SHEETS . . SINGLE PICKLED BLUED ELBOW SHEETS . . FULL PICKLED FULL COLD ROLLED AND REANNEALED SHEETS . . UNIFORM COLOR STEEL SHEETS . . DEEP STAMPING STEEL SHEETS . . EXTRA DEEP STAMPING STEEL SHEETS . . BREAD PAN SHEETS . . DEOXIDIZED SHEETS . . VITREOUS ENAMELING SHEETS . . JAPANNING SHEETS . . WELDING SHEETS . . LOCOMOTIVE JACKET STEEL SHEETS . . BLUE ANNEALED STEEL SHEETS . . BLUE ANNEALED SINGLE PICKLED SHEETS . . CEILING SHEETS . . LOCKER SHEETS . . POWDER KEG SHEETS . . WINDMILL SHEETS . . BARREL SHEETS . . GALVANIZED SHEETS . . GALVANIZED TIGHT COAT SHEETS . . GALVANIZED POSTER PANEL SHEETS . . GALVANIZED CULVERT SHEETS . . ELECTRICAL STEEL SHEETS . . (ALL GRADES)

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STRIP STEEL

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ALL FINISHES
ALL EDGES

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BLACK - PICKLED
GALVANIZED
AND
COPPER BEARING

SHARON
STRIPS *and* SHEETS

SHEETS

BLUE ANNEALED
BOX ANNEALED
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SINGLE PICKLED
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HOLDING THE
SPOTLIGHT

SAVE WITH STEEL

SHARON STEEL HOOP CO.

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Desired Quality *for Forming and* Drawing

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Any size—Any Wall Thickness. For Ring Dies, Punches, Sleeves, Bushings, Cut-edges, etc.
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TOOL STEEL
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It pays to use Good Tool Steel.
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STEEL

44

This SECOND Edition is now ready for distribution

Send for your copy!



SINCE the publication of the first edition of this booklet in 1929, the use of B & W Seamless NIROSTA KA2 has been so wide as to provide a wealth of new information on this alloy.

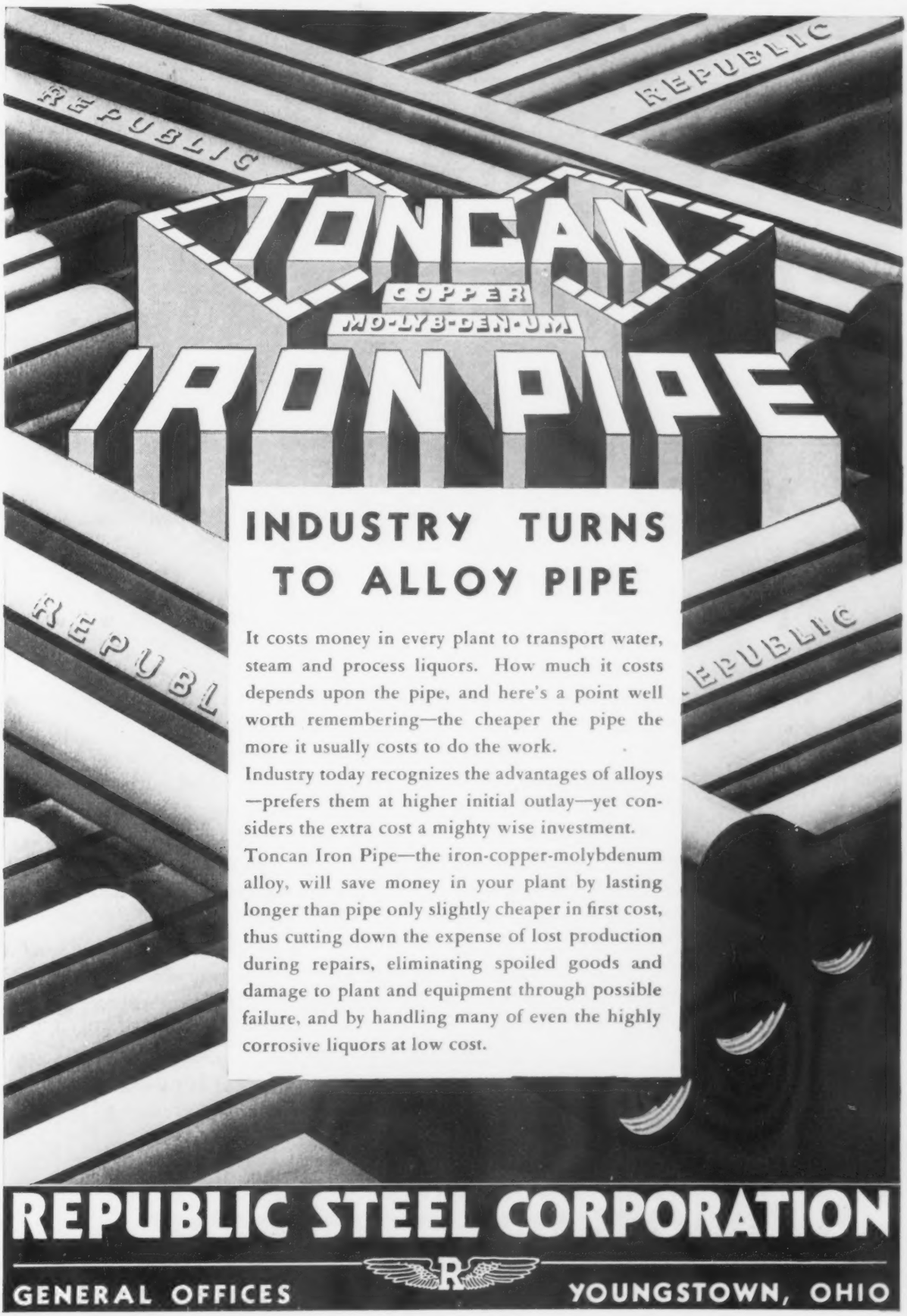
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If you are now using NIROSTA KA2 or other stainless alloys, or if you are contemplating their use in manufacture or processing, this new booklet which contains information available from no other source, will prove of inestimable value to you. Write for a copy.

NIROSTA KA2

THE
BABCOCK & WILCOX TUBE COMPANY

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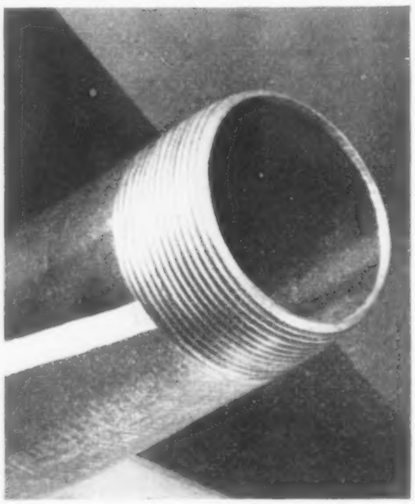

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TONCAN
COPPER
MO-LYB-DEN-UM
IRON PIPE
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TO ALLOY PIPE
It costs money in every plant to transport water, steam and process liquors. How much it costs depends upon the pipe, and here's a point well worth remembering—the cheaper the pipe the more it usually costs to do the work.
Industry today recognizes the advantages of alloys—prefers them at higher initial outlay—yet considers the extra cost a mighty wise investment.
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GENERAL OFFICES
YOUNGSTOWN, OHIO

cutting overtime



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"PIPE PRESCRIPTION" means the selection of a specific kind of pipe to meet a specific condition. It is a successful engineering practice today.



There may be but one kind of pipe in the stock room, but to install that pipe when another kind can serve better is adding labor cost at a later date when premature replacement is necessary.

Substitution of the wrong pipe sometimes leads to an inopportune shut-down, an overtime work order or an upset Sunday.

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The Byers Spiral Stripe on a piece of pipe not only prevents accidental substitution but it's assurance of the highest standard of quality in wrought iron. A. M. Byers Company, Pittsburgh, Pa. Established 1864.

BYERS • GENUINE • WROUGHT-IRON PIPE

AN INVESTMENT • NOT AN OUTLAY

Tubes



TESTED

Here is an example of the kind of testing Michigan welded steel tubing must stand before being approved for production.

This particular piece of tubing from the testing machine has been *expanded* from 2″ to 3″ at one end with no loss of strength at any point in the metal or the weld.

Here, indeed, is a tribute to the skill and care which goes into the making of Michigan tube products.

Micrometer readings show absolute uniformity in wall thickness throughout, and no difference in uniformity between the original tube and the tube after expansion, while the actual variance in wall thickness between this tube and the original is only .0004″.

Because of the great care taken in Michigan welding, this tubing has lost none of the great ductility which characterized it before being so tested.

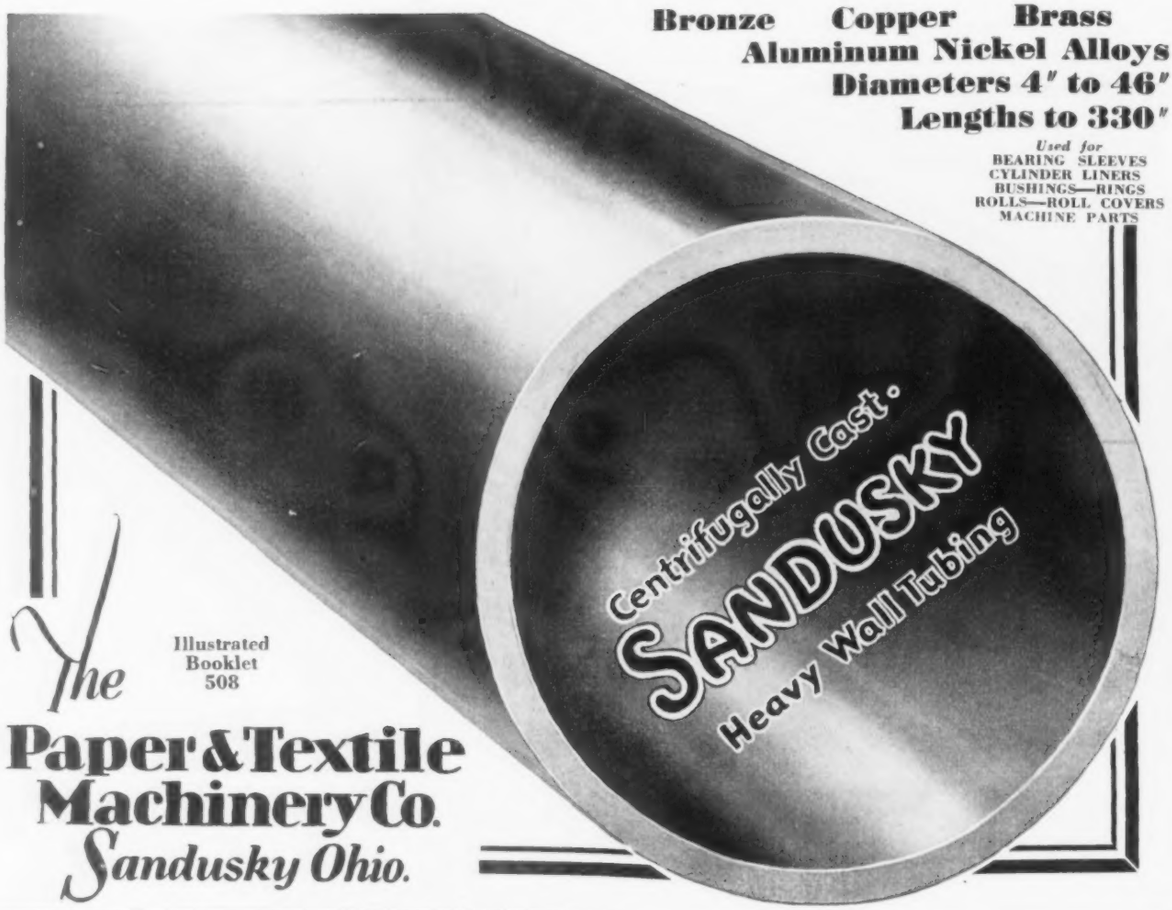
Such tests as this assure the users of Michigan Steel Tubing that the product they receive will more than answer any demands put upon it.

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ST. LOUIS—E. R. Hensel Steel & Copper Co., Planters Bldg.

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STEEL TUBE PRODUCTS COMPANY
BUFFALO STREET, DETROIT

Bronze Copper Brass
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Diameters 4" to 46"
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Illustrated Booklet 508

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Boiler Tubes — Tubular Products

To meet the needs of our constantly increasing trade and to render more efficient and prompt SERVICE when SERVICE counts—

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Secure our PRICES and STOCK LIST—they will enable you to BETTER MEET COMPETITION.

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Seamless Tubing of Steel, Brass, Copper Aluminum Nickel-Silver

Specialists in Precision and Hypodermic Needle Tubing

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Manufacturers and Warehousers, Aircraft Steels, also Commercial Steel.

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from mine to consumer
99.99% Pure
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ALL REFRACTORY MATERIAL
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The Shenango Furnace Co.

Lake Superior Iron Ores
Bessemer, Non-Bessemer,
Aluminiferous

Shenango Pig Iron
Bessemer, Basic, Malleable,
Foundry

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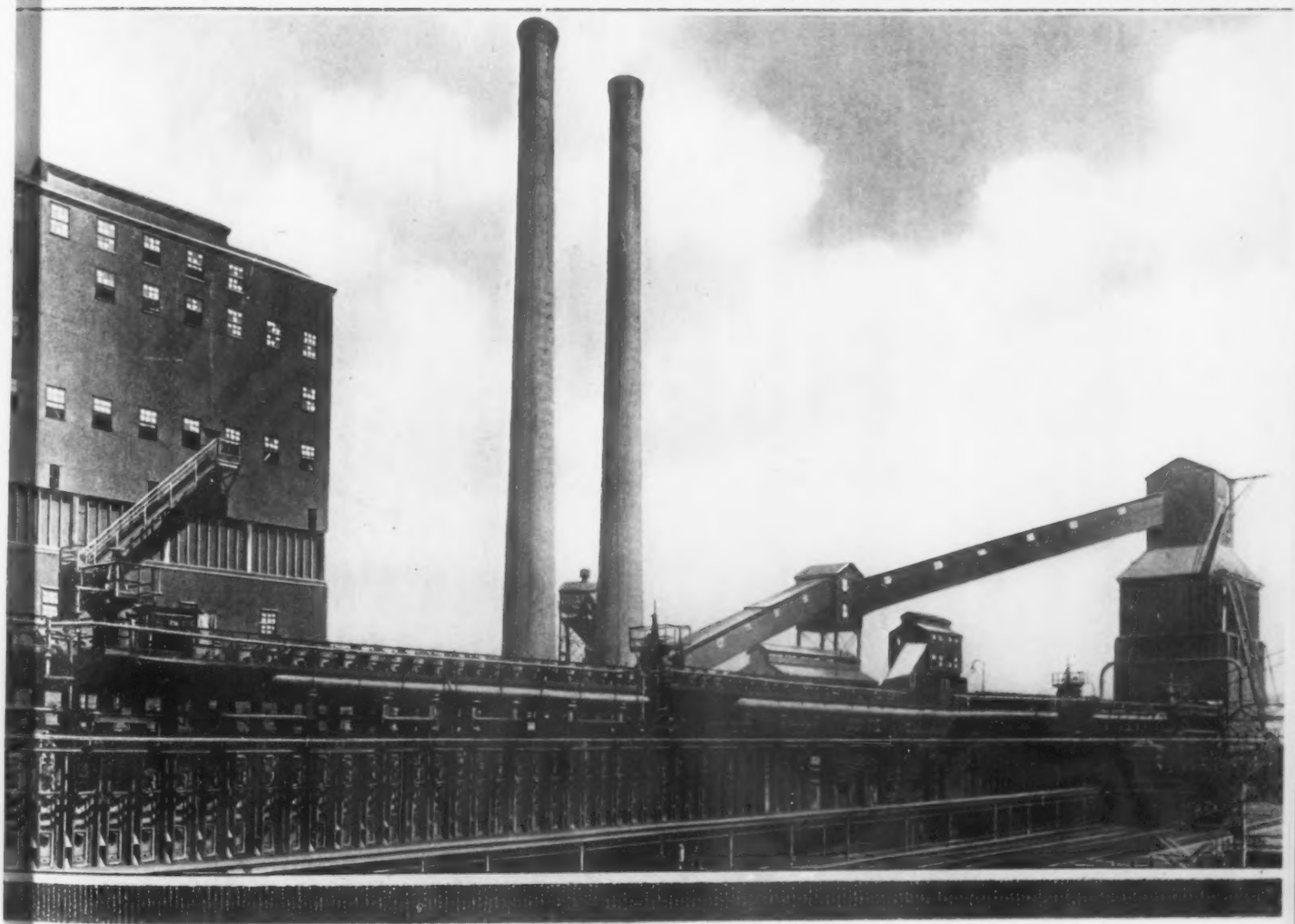
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Ingot Molds, Centrifugally Cast Bronze Bushings

PITTSBURGH, PA.

IN THIS BATTERY OF MODERN COKE OVENS



And in the Blast Furnaces, Stoves, Metal Mixer and Open Hearths<<

Pittsburgh Crucible's Midland Plant Uses Harbison-Walker Refractories

CONSIDER the refractories problem of the modern steel plant: fireclay brick for blast furnaces and stoves; silica and fireclay brick in coke ovens; chrome, magnesite, silica and fireclay brick in the open hearths; fireclay brick in the metal mixers; high temperature cements and ground fireclays—few industries require as many types or as large a consumption of refractories.

Among the steel plants in which Harbison-Walker refractories have repeatedly proved their dependability and economy is the Midland, Pa., plant of the Pittsburgh Crucible Steel Company. In this well-known plant:

—blast furnaces and stoves are lined 100% with Harbison-Walker refractories, laid with Firebond High Temperature Cement and Bond "B" clay.

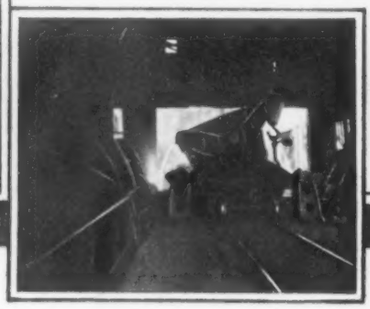
—all refractories—fireclay and silica—in the coke oven installation are Harbison-Walker.

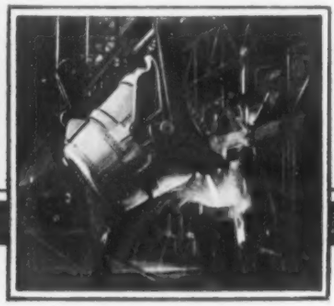
—the metal mixer is lined 100% with Harbison-Walker brick and fireclay.

—all the silica and magnesite brick and dead-burned grain magnesite used in the open hearth department are likewise Harbison-Walker.

Are you familiar with the dependability and economy of Harbison-Walker refractories?







HARBISON-WALKER REFRACTORIES COMPANY

World's Largest Producer of Refractories

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By-Product	—Coking
*Jerome Low Volatile Smokeless	—By-Product mixtures, Bunkering, Steam purposes where a smokeless fuel is required
Steam	—Industrial Plants, Locomotives
Production	—5,000,000 Tons Annually

**A modern Cleaning Plant at Jerome Mines guarantees a uniformly Low Ash, Low Sulphur Product.*

COKE

Special Low Phosphorus	—Low Phosphorus Pig Iron
Standard Connellsville Furnace Coke	—Blast Furnace practice
Foundry	—Cupolas, etc.
Smelter	—Copper, Lead and Nickel smelting
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Are there

WEAK SPOTS

in your

FURNACES?

Experience proves that, in most heat processes employing refractories, there are certain spots which are constantly demanding repairs or replacements.

It is in such spots that we especially invite your tests of Corhart Electrocast—a new and different type of super-refractory.

An Entirely New Refractory

Corhart Electrocast is in no sense of the word an ordinary refractory. It is made by melting high-aluminus silicates at temperatures greatly exceeding those of even forge, steel or glass-melting furnaces, then pouring into molds for final annealing.

Ideal for Furnace "Weak Spots"

Because of its unique *combination* of physical characteristics *, Corhart Electrocast has been proven to be ideally suitable for use in forge furnaces, high-temperature boilers, glass furnaces, cement kilns. . . Without knowing your own particular requirements, we can not, of course, predict what your results with Corhart Electrocast might be. May we suggest that you write, outlining your refractory requirements? You will meet with a sincere and straight-forward statement of our qualifications or dis-qualifications as applied to your own individual needs. You will *not* be subjected to any kind of high-pressure follow-up. *Address:* CORHART REFRACTORIES CO., *Incorporated,* Sixteenth and Lee Streets, Louisville, Kentucky.

IN EUROPE	IN JAPAN
L'Electro-Refractaire	Asahi Glass Co.
5 Rue Cambaceres, Paris	Marunouchi, Tokio

*** The following is an accurate and conservative statement of Corhart Electrocast characteristics:**
Almost Zero Porosity*—less than ½ of 1%. (Details on request). . . *High Fusion Point*—cone 35, without appreciable softening below that point. (Details on request). . . *Resists Corrosion*—unusually resistant to slags and glasses. (Details on request). . . *Withstands Temperature Changes*—due to its thorough annealing. (Details on request). . . *Harder than Glass*—cannot be chipped or sawed or cut. *Write for Bulletin No. 51-I.

QUALITY ECONOMY ENDURANCE

CORHART ELECTROCAST REFRACTORIES

Pioneers in



CHROME REFRACTORIES



Crude Chrome Ore





Chrome and Magnesite Brick

The high fusion point and chemically neutral characteristics of Chrome Ore make it, when properly prepared, one of the most important natural refractories known.

Through research, and the co-operation of consumers we have developed, over a period of years, a group of Chrome Refractories which has made possible many worth while economies.

This "Partnership in Pioneering" with your industry has enabled us to produce:

"LAVINO" CHROME BRICK— which revolutionized basic open hearth construction.

GROUND CHROME ORES— properly prepared, to insure a uniform product and dependable performance.

KROMEPATCH—the Multi-Bond dry Chrome Ore cement, which prolongs the service life of furnace linings.

PLASTIC K-N—the most permanent and reliable furnace bottom refractory.

However, do not overlook "Lavino" Magnesite Brick. The only Magnesite Brick burned in continuous tunnel kilns.



The Dry Chrome Ore Cement



The Plastic Chrome Ore Refractory

"America's Largest Importers of Chrome Ores"

E. J. LAVINO AND COMPANY

REFRACTORIES DIVISION

CHROME, MAGNESITE AND SILICA REFRACTORIES

CHICAGO PHILADELPHIA PITTSBURGH

"Trade Mark" Registered

"MICA SCHIST"

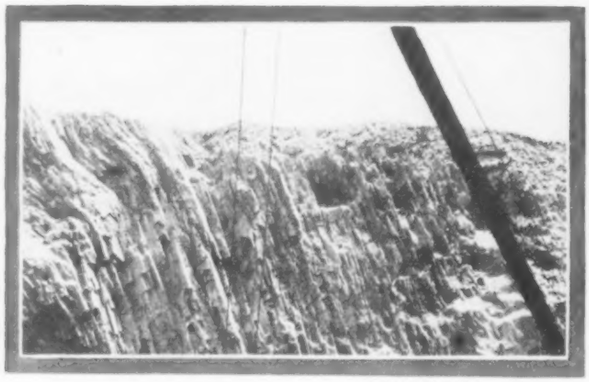


The Natural Fire Brick for lining

BESSEMER CONVERTERS
HOT METAL MIXERS
SOAKING PITS
FURNACES
OVENS, LADLES

"Mica Schist" mined in large blocks, comes to you ready for immediate use without further treatment. It may be used in block form for lining—flat thin pieces for patching—pulverized for cement or cupola daub. There is no waste.







Over 200,000,000 Tons of Gray Iron and Bessemer Steel made with "MICA SCHIST" Lining in the past 25 Years

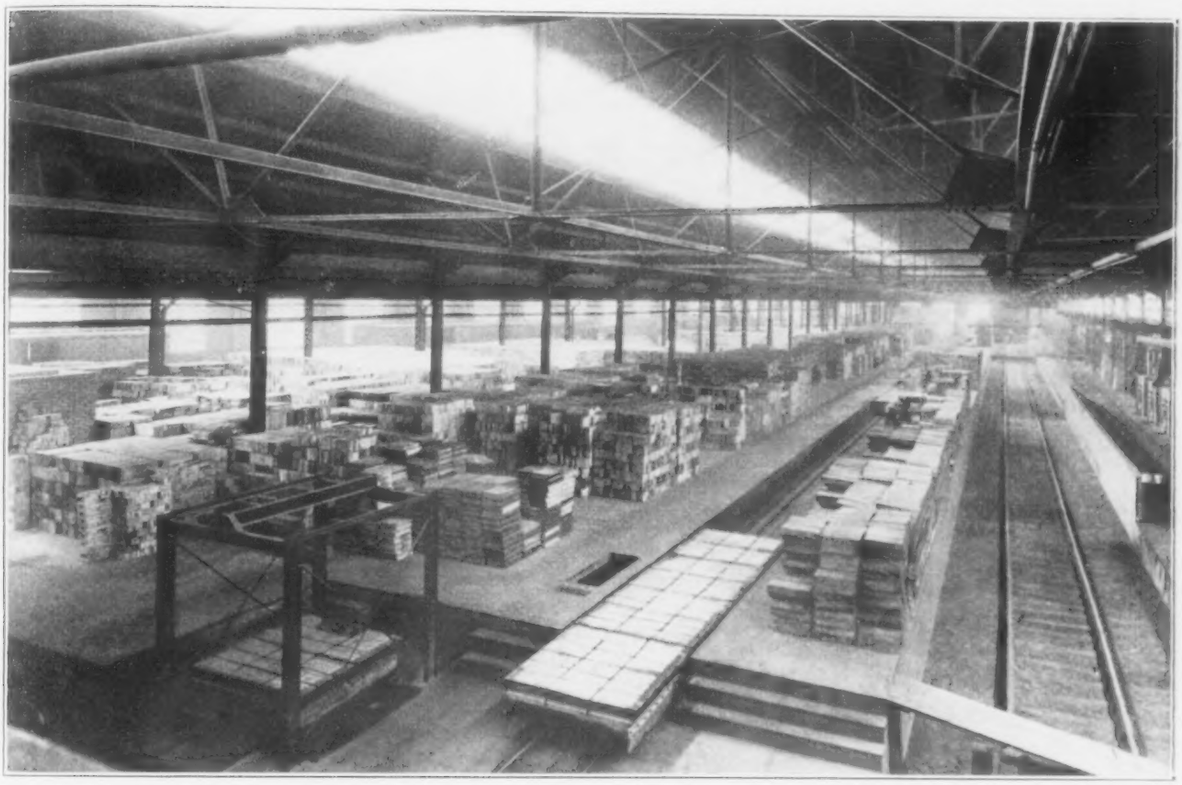
This is what HAS HAPPENED, not what may happen. Hundreds of foundries and steel plants use "Mica Schist" the ideal refractory—especially adapted for sudden and severe changes of temperatures. In the Bessemer Converter where 3500° F. is reached, "Mica Schist" is the standard lining. Its correct structure and analysis which prevent expansion and contraction are necessary for the ideal lining. Slag and clinkers do not adhere to it. Easy and economical to apply. Shipped in bulk, a lower freight rate further reduces its cost.

EDGE HILL SILICA ROCK CO.

New Brunswick, N. J.

Incorporated 1903

SALINA FIRE CLAY BRICK



From this modern plant direct to you

We aim to render a better and quicker service by means of the most up-to-date equipment.

ALL SALINA BRICK are made from the finest of raw materials, carefully selected, automatically weighed and mixed.

ALL SALINA 9″ and series brick, as well as many large standard tile and shapes are manufactured by the DRY PRESS METHOD.

ALL SALINA BRICK are burned in continuous car tunnel kilns, pyrometrically controlled.

Yough brick, our specialty for lining soaking pits, is rendering unusual service throughout the industry. Write us for further information.

The Kier Fire Brick Company

Oliver Building Established 1845 **Pittsburgh, Pa.**

ALL SALINA BRICK ARE TUNNEL KILN BURNED

SPECIALIZED REFRACTORY MATERIALS

● Long life from refractories calls for more than good workmanship in installation, more than high quality materials . . . . it calls for a careful analysis of the TYPE of material best suited to specific requirements.

North American Refractories are able to recommend and supply you with the exact refractory material to best answer your requirements, whether it is for a minor repair or the installation of a battery of furnaces.

The combined facilities of 17 modern plants and the combined experience of eight associated companies has been brought together in one service organization. In all, the experience of these companies averages 40 years. Each of the eight North American sales offices, each member of these sales offices, is backed by this experience.

You will find it is just good business to consult North American when you are in need of refractory service.



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HAMILTON
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REFRACTORIES, Ltd.
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LOFTUS CHECKER BRICK . . .

A patented checker brick construction that exposes maximum area of brick, insuring complete heat penetration, eliminating cold centers. Makes setting rigid, eliminates distortion of individual pieces. Permits proper velocity and minimizes friction in passage and danger of clogging.

NARFRAX HIGH ALUMINA BRICK

50, 60, 70 or 80% alumina content, made from the finest grade of Diaspore clay, bonded so that «after shrinkage» is entirely eliminated.

NARCOSET . . .

High temperature bonding mortar . . . easily troweled, sets hard at room temperature, withstands high temperature without softening. Shipped wet.

NARCO 505 FURNACE PATCH

A quickly applied wet patch equal in refractory properties to highest grade brick

NORTH AMERICAN REFRACTORIES CO.

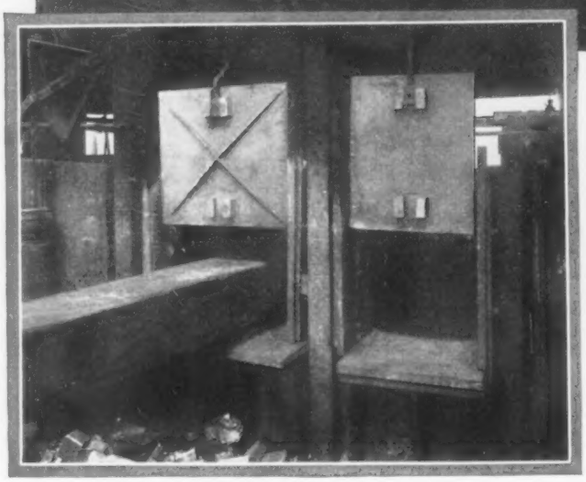
GENERAL OFFICES: NATIONAL CITY BANK BUILDING • CLEVELAND, OHIO

7

times former bottom life with

GREFCO

Chrome High Temperature Cement



Exterior of billet heating furnace at A. Finkl & Son, Chicago. Note the large size of the billet (14" x 18", 14' long) weighing from 4 to 6 tons.



This is the GREFCO bottom after 14 months of service. Note the lack of wear except the groove in the rear where the entire weight of the billet is supported.

TWO months was formerly the life of brick bottoms in the billet heating furnaces of A. Finkl & Son, Chicago.

Now with a GREFCO bottom, rammed in to 4½" depth, the life has already reached 14 months with the result shown above.

The original GREFCO bottom is still in good condition, and has already outlasted two roofs and sidewalls.

GREFCO has solved many furnace lining problems. How about yours?



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Manufacturers of High Grade Refractories for 62 Years.
TIGER STEEL—Made from Kentucky fire clays.
TAYCO—The famous high-alumina special refractory brick.
P. B. SILLIMANITE—A super-refractory for the most severe furnace conditions.
We can help you with your most difficult furnace problems. Inquiries are solicited.
GENERAL OFFICE—CINCINNATI, OHIO

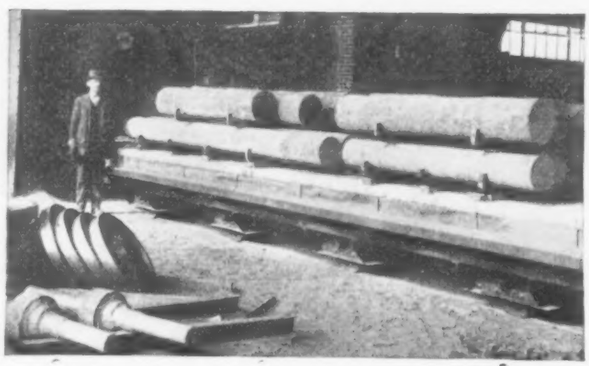
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SAVE YOU LABOR AND MATERIAL
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AUTOMOBILE CARRIAGE SPECIAL
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THE buyer will continue to be mighty discriminating when it comes to product values. To win his favorable action manufacturers must do everything within their power to improve the style, serviceability and value of their products.

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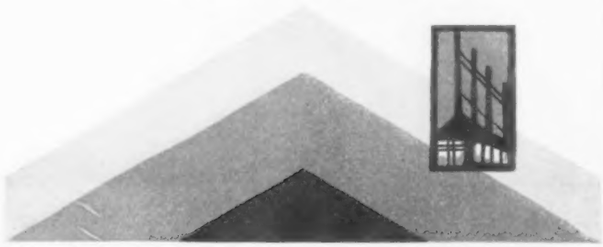
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Castings for Oldroyd Coal Cutters and Coal Loaders

QUALITY

There is no substitute for quality in Steel Castings. Every Casting produced —large or small—becomes an integral part of your finished product. Its success, to a large degree, is determined by the substantialness of the castings. With this thought in mind, only the highest grade steel is used in Commercial Steel Castings to protect the many intricate shapes for which Commercial is responsible. Add to this skilled workmanship, 12 years experience, and you have the fundamentals for Commercial's success. Commercial Castings will add many years of service to your product.



COMMERCIAL STEEL CASTINGS CO.
SUBSIDIARY, THE OSGOOD COMPANY, MARION, O.

OPEN HEARTH
STEEL CASTINGS
and
Hammered and Steam Hydraulic
PRESSED FORGINGS
Large Capacity Prompt Shipments
ERIE FORGE CO.
ERIE, PA.

Strong Steel Foundry Co.
Acid open-hearth steel
Buffalo, N Y.



ELECTRIC STEEL CASTINGS
From ¼ to 2000 lbs. in Quantities
The INDUSTRIAL STEEL CASTING CO.
TOLEDO, OHIO

SPECIAL ALLOY CASTINGS
to resist OXIDATION, CORROSION, ABRASION
Modern equipment—Expert Metallurgical staff
We solicit your inquiries
NATIONAL ALLOY STEEL CO.
BLAWNOX, PA.

STEEL CASTINGS
Up to 10,000 lbs. Each
MAYNARD ELECTRIC STEEL CASTING CO.
2856 So. 27th St., Milwaukee, Wis.
INQUIRIES INVITED

From a Pound to a Ton **ELECTRIC** *Inquiries Solicited*
STEEL CASTINGS
CRUCIBLE STEEL CASTINGS COMPANY
LANSDOWNE, DELAWARE COUNTY, PENNSYLVANIA
(Near Philadelphia)

Electric Acid Open Hearth
STEEL CASTINGS
Atlas Steel Casting Company
BUFFALO, N. Y.
New York Office: 60 E. 42nd St., New York.

CIRCLE "L"-2

ONE OF LEBANON'S ALLOY STEELS

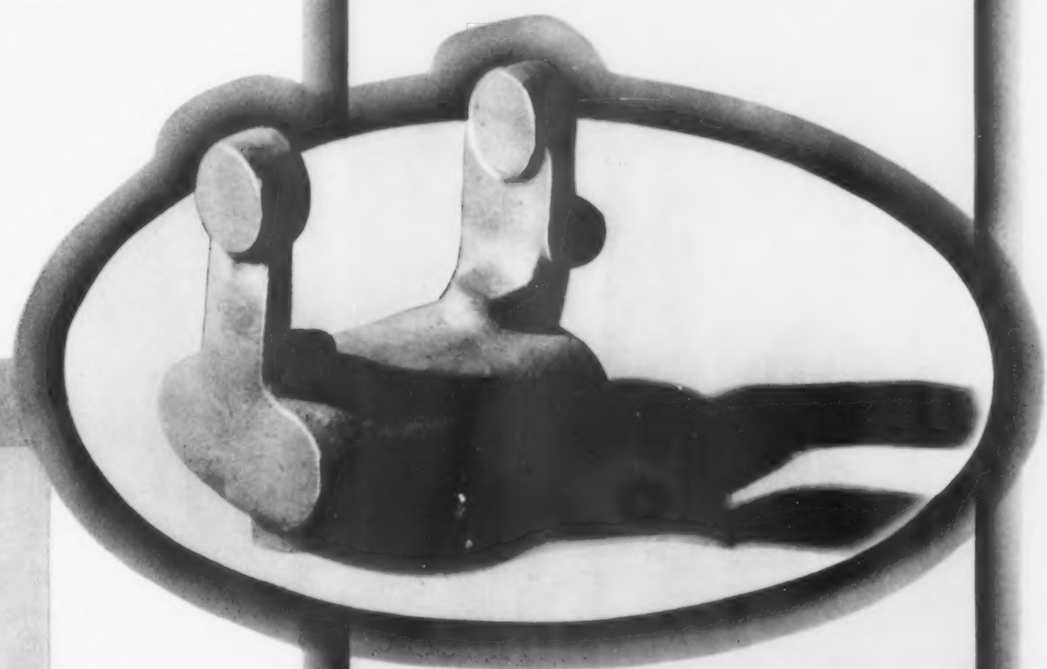
CIRCLE "L"

Known for Its High Tensile and Yield Characteristics
Plus Maximum Ductility

By accurate control of carbon, chromium and molybdenum contents, Lebanon has developed, in Circle "L"—2, an alloy casting steel that will interest a great number of manufacturers.

It offers to machinery builders a casting steel that will strengthen machine parts and castings without the addition of weight or adding appreciably to the difficulties of machining. Circle "L"—2 is a moderately-priced alloy steel having physical properties beyond the ability of carbon steel.

All Circle "L"—2 castings are made under the supervision of a highly-trained personnel. Modern facilities, including arc and induction melting furnaces, the most recent heat-treating methods, scientific sand control, and the latest molding practice, assure consistently-dependable steel castings.



Improve your products by the use of alloy steel castings. Lebanon engineers will be glad to cooperate with you.

LEBANON STEEL CASTINGS
CARBON-STAINLESS ALLOY STEELS

CIRCLE "L"-2 HAS MANY USES



These landing gear axle fittings are not called upon to serve often, but when the large plane, on which they are used, lands or takes-off, these castings are highly important. Circle "L"—2 not only possesses the required strength but also meets another requirement—light weight.

Castings of Circle "L"—2 are being utilized for a great many purposes. In a growing number of instances, this particular steel is used to replace other materials.

On airplanes, pumps, pneumatic tools, machine tools, valves, etc., Circle "L"—2 is providing greater strength without added weight. By variations in heat-treatment, quenching and drawing, castings of Circle "L"—2 can be provided to meet with exactness any conditions where a metal of this type is appropriate.

CIRCLE "L"



Another airplane part—the landing gear tail wheel fork—used on heavy planes. It is the first part to leave the ground and the last to come down. A failure here may result in a bad accident. Circle "L"—2 serves reliably without adding excessive poundage.



Vibrations in air-operated tools are terrific, and castings used must have high tensile and yield values as well as toughness. Dependable paving breaker handles are being cast in quantity for one of the large pneumatic tool builders. Circle "L"—2 is the steel used.

Electric Furnace Steel Castings

LEBANON STEEL FOUNDRY

LEBANON PENNA.



SAVE MONEY on Important Iron Castings . . . use MEEHANITE

CASTINGS made by the Meehanite Process not only have a greater range of desirable physical properties, but specified characteristics in the finished casting are guaranteed. Usual allowances for wide variations in the strength, rigidity, hardness or any other quality of the metal are not necessary. Consequently Meehanite castings can be designed with a lower factor of safety on the positive assurance of their uniformity« « » » Substantial reductions in casting weight for the same service requirements are safely permitted in Meehanite, due to the greater strength and density of the metal« « » » Scrapped castings due to hard spots, brittle corners, spongy regions, planes of weakness or other defects found in ordinary grades of cast iron are eliminated when Meehanite is used« « » » Machine time is greatly reduced in finishing the Meehanite casting because of the superiority of its homogeneous metal structure« « » » The better wearing qualities of Meehanite castings result in a markedly lower replacement cost« « » » Get data applicable to your specific casting problem from the nearest Meehanite Foundry.

PHYSICAL PROPERTIES

Castings made under the Meehanite Process are superior to other irons. They have:
Greater Strength and Toughness.
More uniform grain Structure and Hardness.
Greater Resistance to Abrasion.
Greater Density.
Higher Resistance to Corrosion.
Freedom from spongy regions regardless of casting section.
Better Machinability.

Specific properties obtainable on specification:

Tensile Strengths to 50000 lbs. without heat treatment.
Tensile Strengths to 70000 lbs. with heat treatment.
Brinell Hardness up to 600 by heat treatment.
Six times the impact strength of semi-steel.

METAL

U. S. Patent Nos.: 1,449,068 1,683,087 1,683,088 1,731,346. Canadian Patent Nos.: 234,932 287,903 304,254. Other patents pending.

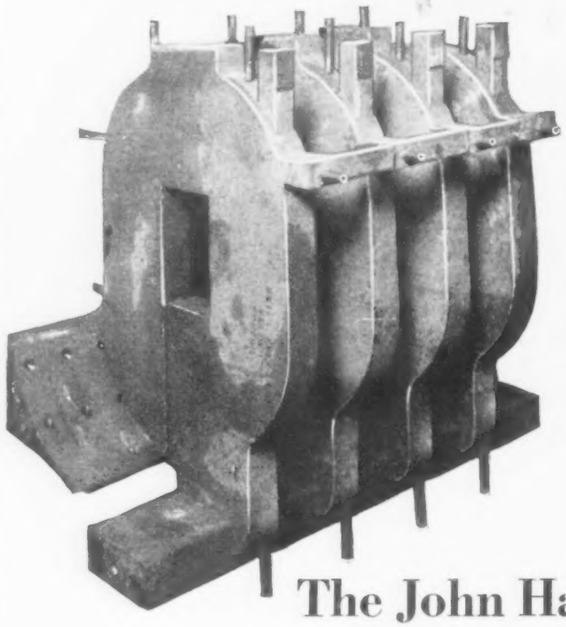
MEEHANITE INSTITUTE

MEEHANITE FOUNDRIES

CHATTANOOGA, TENN.—Ross-Meehan Foundry Co. • • CHICAGO, ILL.—Greenlee Foundry Co. • • CLEVELAND, OHIO—Fulton Foundry & Machine Co. • • DETROIT, MICH.—Michigan Valve & Foundry Co. • • INDIANAPOLIS, IND.—Indianapolis Casting Co. • • PHILADELPHIA, PA.—H. W. Butterworth & Sons • • PITTSBURGH, PA.—Rosedale Foundry & Machine Co. • • ST. LOUIS, MO.—Banner Iron Works • • TRENTON, N. J.—Trenton Malleable Iron Works • • TORONTO, ONT.—Dodge Manufacturing Co. • • TORONTO, ONT.—Jessop Steel Company

4500 POUNDS~

AND PURE COPPER TOO!



Not merely because of its size, nor yet because of the fact that it is made of pure copper, but because in every way it represents the high type of work we enjoy doing, we feature in this advertisement this secondary casting.

It is just one of four recently produced for the Swift Electric Welder Co. of Detroit, Michigan. They were used in a giant welder capable of welding a 56" pipe casing with a 5/8" wall thickness. The completed welder had a total KVA rating of 4800.

The iron pipes shown in the cut are cast directly into the copper casting.

WE SPECIALIZE IN

Pure Copper Castings, also Acid Resisting Castings, Manganese Bronze, Aluminum Bronze for Welding Dies, and Aluminum Alloy Castings.

The John Harsch Bronze & Fdry. Co.
11612 Madison Ave., Cleveland, Ohio

The Cincinnati Steel Castings Co.
Manufacturers of
ELECTRIC STEEL CASTINGS
SPECIAL STEEL
Vanadium Chrome Case-Hardening Motor-Steel Nickel Steel
Spring Grove, Alabama and Bates Aves., Cincinnati, O.

ELECTRIC STEEL CASTINGS
Carbon Steel. Also Alloys chrome, nickel vanadium. Modern plant. Good service.
CRUCIBLE STEEL CASTING CO.
CLEVELAND, OHIO

SMALL ELECTRIC STEEL CASTINGS
(Capacity 500 Tons per Month)
THE WEST STEEL CASTING CO.
CLEVELAND OHIO, U. S. A.
"He Profits Most Who Serves Best"
Better Steel Castings

TREADWELL
ELECTRIC FURNACE
STEEL CASTINGS UP TO 6000 LBS.
Any Carbon or Alloy
High Pressure Castings a Specialty
TREADWELL ENGINEERING CO.
EASTON PENNSYLVANIA

HEAT-TREATING FACILITIES
SMITH STEEL CASTINGS
CARBON ALLOY DYNAMO
PRODUCTION ELECTRIC STEEL CASTINGS
GEO H. SMITH STEEL CASTING CO.
MILWAUKEE, WISCONSIN.

STANLEY G. FLAGG *and* CO., *Inc.*
1421 Chestnut St., Philadelphia, Pa.
TANK-Service Station and Oil Fittings
Malleable and Gray Iron Castings rough and finished. Malleable Cast Iron and Red Brass Pipe Fittings, Brass Valves

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Steel castings of every description ~ Inquiries solicited
AMERICAN STEEL FOUNDRIES
Address all communications to Dept. M.
Room 1684 Wrigley Bldg. Chicago

CAST AL STEEL

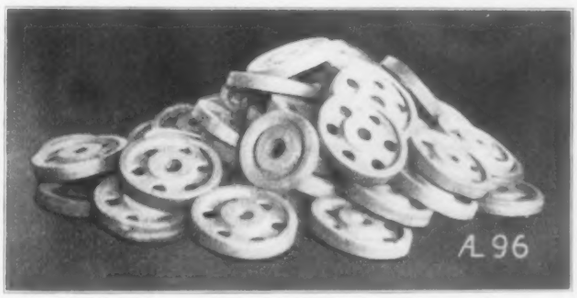


STEEL CASTINGS

MADE OF
WEAR RESISTING ALLOYS
NICKEL
NICKEL-CHROME
MOLYBDENUM
VANADIUM
1½% MANGANESE
12½% MANGANESE
ALSO REGULAR CARBON STEEL



PATTERNS
CASTINGS
MACHINE WORK



MODERN EQUIPMENT
TO PRODUCE
ALLOY STEEL
AND
CARBON STEEL CASTINGS
UP TO 3 TONS

MORE STRENGTH + DUCTILITY PER DOLLAR

Regular Carbon Steels having tensile strengths from 60,000 to 150,000 pounds per square inch and elongations from 15% to 35%.

Alloy Steels having tensile strengths from 75,000 to 200,000 pounds per square inch and elongations from 10% to 30%.

THE ALLOY CAST STEEL COMPANY
MARION, OHIO

DISTRICT OFFICES:

1002 Tribune Bldg. NEW YORK, N. Y.
416 First National Bank Bldg. CINCINNATI, OHIO
1350 Washington Blvd. CHICAGO, ILL.
429 Fisher Bldg. DETROIT, MICH.
470 Hanna Bldg. CLEVELAND, OHIO

Steel castings of every description ~ Inquiries solicited
AMERICAN STEEL FOUNDRIES
Address all communications to Dept. M.
Room 1684 Wrigley Bldg. Chicago

MALLEABLE IRON CASTINGS
NEWARK MALLEABLE IRON WORKS
QUALITY NEWARK, N.J. SERVICE

MALLEABLE IRON CASTINGS
Quality and Quantity Producers
VERMILION MALLEABLE IRON CO.
Manufacturers of
CERTIFIED MALLEABLE IRON
1310 *Railway Exchange Bldg.* CHICAGO — HOOPESTON — 302 *N. Sixth Ave.* ILLINOIS

Malleable
CASTINGS
of Uniform Quality
ARE PERMANENT

FTP

CURRENT AVERAGE TESTS
for 12 months
910 Consecutive Heats

	Tensile Strength Lbs. per sq. in.	Yield Point Lbs. per sq. in.	Elong. % in 2 in.
HIGH	61370	40420	28.1
LOW	56490	37210	22.6
AVERAGE	58344	38494	25.9

This
Trade-mark is your security for a Dependable Product

Send Blue Prints for Estimates
Fort Pitt Malleable Iron Company
PITTSBURGH, PA.

PEORIA
Malleable Castings Co., Peoria, Ill.
Castings of Guaranteed Quality
Peoria Detachable Sprocket Chain
Prompt Service and Shipments
CERTIFIED MALLEABLE CASTINGS

NR
Malleable Castings
of GUARANTEED QUALITY
for Railroad, Agricultural Implement and Automobile Requirements
NORTHERN MALLEABLE IRON CO.
ST. PAUL, MINN.

Richmond
malleable castings
RICHMOND MALLEABLE CASTINGS CO., RICHMOND, INDIANA

Light Weight
CERTIFIED MALLEABLE CASTINGS
MEEKER FOUNDRY CO.
Malleable Founders for 85 Years
Clay Street Newark, N. J.

GRAY IRON CASTINGS
We are specialists in this line



Fine small Hardware Castings, Ingot Molds for Brass and Copper, Manhole Frames and Covers, Building Castings, General Machinery Castings.
Up to 30 Tons Each
THE SESSIONS FOUNDRY CO. ESTABLISHED 1879 BRISTOL, CONN.

DIE-CAST BY STEWART



Stewart delivers over 1,500,000 of these die-cast cradle telephone parts to customers per year. Orders large and small receive the same dependable service.

YOUR PRODUCT Too, Deserves STEWART DIE-CASTINGS

WHY take chances with die-cast parts that have not proven their worth when STEWART can give you the utmost in DEPENDABLE Quality — Price — Service. STEWART has been giving quality service for years—and *will continue* for years to come.

A record of service — years of experience — modern methods — an organization of experts — the largest and finest equipped plant devoted exclusively to die-casting in the world — those are some of the reasons why STEWART offers definite die-casting advantages.

Remember STEWART, then, for strong, finely finished, accurate die-castings — and SERVICE you can bank on. Call in one of our engineers for practical information when the die-casting subject arises. Blue-prints or samples of your product will bring an estimate. Or why not MAIL THE COUPON for our new booklet. It contains brief, factual information about the die-casting process in all of its modern phases. It will be of interest and value to you.



STEWART DIE-CASTING CORP.
4531 Fullerton Ave., Chicago, Ill.

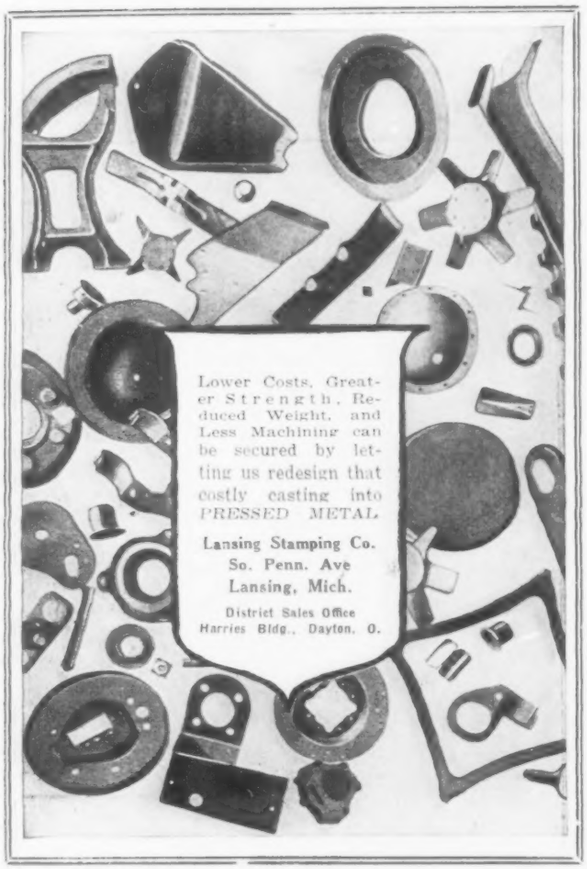
Send me your new "Engineers Die-Casting Handbook" which describes the Stewart process of die-casting and what it can do for me.

Name .....

Address .....

Stewart

THE STEWART DIE-CASTING CORP., 4531 Fullerton Ave., Chicago, Ill.



IT'S THE ORGANIZATION
Behind the Product
that Protects Your
Investment

MIF

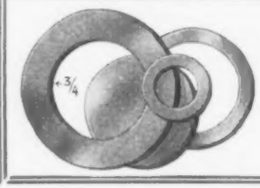
Adequate and effective foundry equipment cuts the cost, makes better castings, and assures delivery on time.

Here you will find these things working for you all the time on every order.



MALLEABLE IRON FITTINGS CO.
BRANFORD, CONN.

BRASS, BRONZE OR COPPER
Castings
Let us quote on present requirements
Lumen Bearing Co., Buffalo, New York



HEAVY PUNCHINGS
LIGHT STAMPINGS
Washers Our Specialty
70 years Assortment of Punches and Dies enables us to furnish variety of Washers without tool charges.
THOMAS SMITH CO.
286 Grove St., Worcester, Mass.

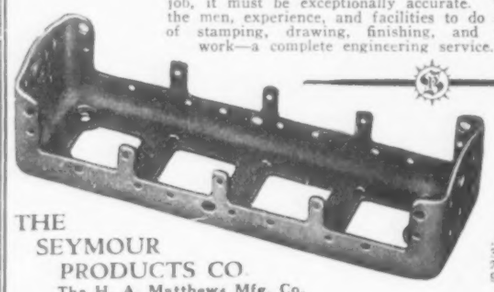
GOOD STAMPING
GOOD DIES
DETROIT STAMPING CO.
3445-65 W. Fort St., Detroit, Mich.



STAMPINGS THAT IMPROVE YOUR PRODUCT
Better stampings mean a better product, lower assembly costs, and a big saving in time. Write.
MAKERS OF "TROUBLE-FREE" STAMPINGS
New England Pressed Steel Co.
1 Washington Ave., Natick, Mass.

Stampings
TOOLS, DIES, TURNING BRASS AND ALUMINUM CASTINGS, GRINDING, POLISHING, PLATE ENAMELING AND ASSEMBLING.
A complete outfit at your service on any of the various operations. Send us your drawings, blue prints or samples for quotations.
DOUGLAS & LOMASON, 5836 Lincoln Ave, Detroit, Mich.

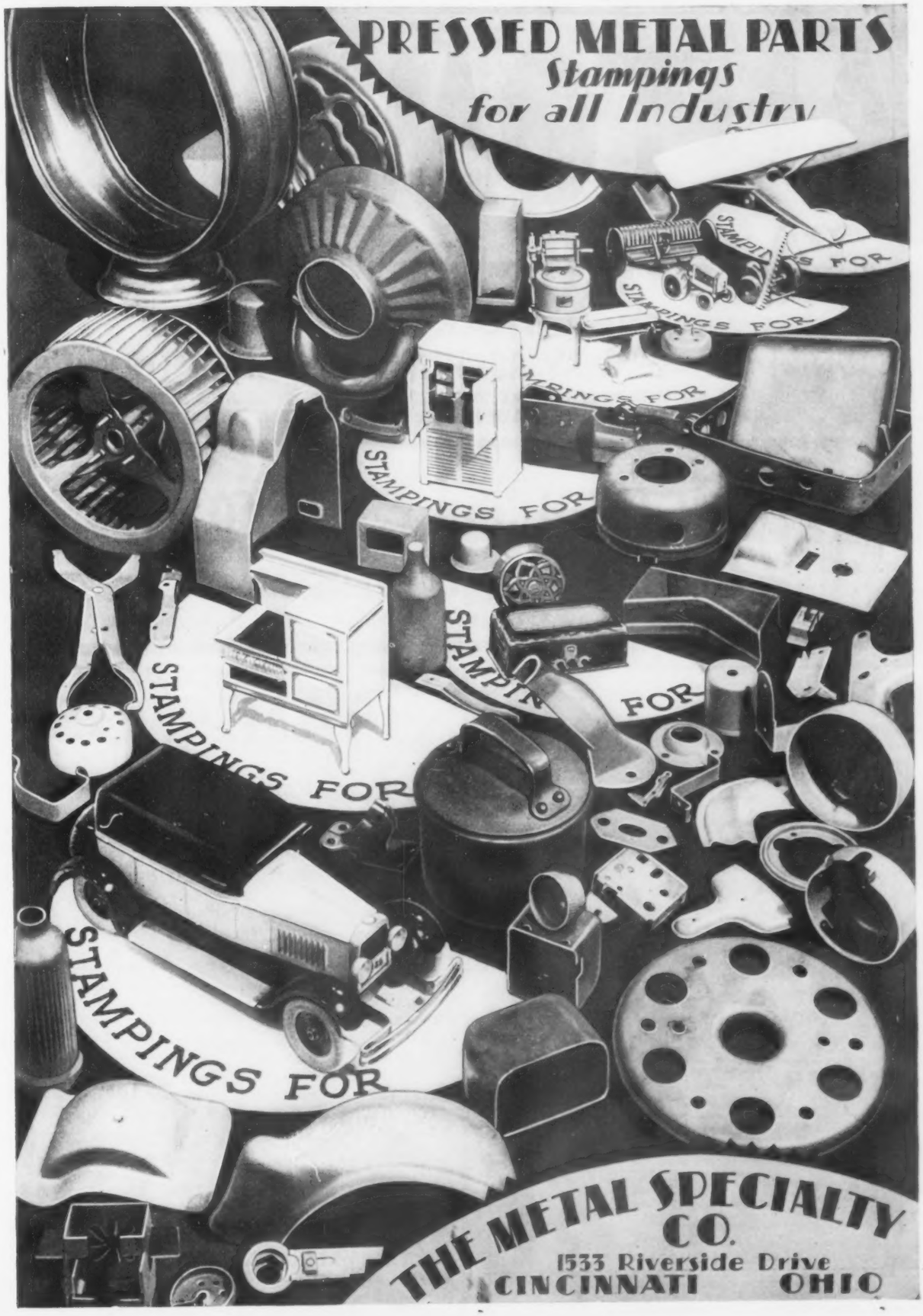
53 Accurately Located Holes in this Condenser Cradle!
Besides being an intricate stamping and drawing job, it must be exceptionally accurate. We have the men, experience, and facilities to do all kinds of stamping, drawing, finishing, and assembly work—a complete engineering service.



THE SEYMOUR PRODUCTS CO.
The H. A. Matthews Mfg. Co.
The Seymour Metal Goods Co.
99 RIVER ST., SEYMOUR, CONN.
EST. 1890

STEEL STAMPINGS
Flat and Formed Pieces of Medium Size our Specialty
LIGHT WASHERS AND BURRS
JAPANNING, TINNING, ELECTRO PLATING
J. H. SESSIONS & SON
BRISTOL, CONN. U. S. A.

STAMPINGS
Die Makers
THE E. KONIGSLOW STAMPING & TOOL CO.
Cleveland, Ohio.

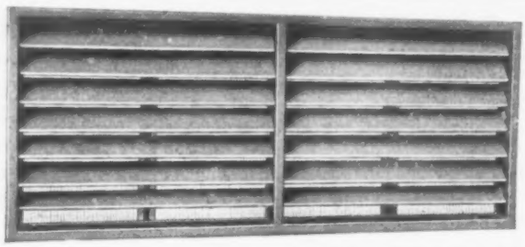

PRESSED METAL PARTS
Stampings
for all Industry
STAMPINGS FOR
STAMPINGS FOR
STAMPINGS FOR
STAMPINGS FOR
STAMPINGS FOR
STAMPINGS FOR
THE METAL SPECIALTY CO.
1533 Riverside Drive
CINCINNATI OHIO

AUTOMATIC
STAMPING & FORMING

FROM RIBBON STOCK IN QUANTITIES
MADE THE SAME WAY AS AUTOMATIC WIRE FORMING.

YOU WILL BE ASTONISHED AT THE ECONOMY OF TIME AND EFFORT WE OBTAIN BY COMBINING A NUMBER OF OPERATIONS INTO ONE

EASTERN TOOL & MFG. CO.
BLOOMFIELD, NEW JERSEY



SHUTTER LOUVRES

In any quantity desired. We are in a position at this time to give you an attractive price and prompt delivery.

We also make stamped Louvres with permanent openings to your requirements.

SHEET METAL PARTS

Made to your order with exactness and skill at moderate prices

THE BREESE BROS. CO.
Cincinnati, Ohio

MAKERS OF
TOTE BOXES—SHOP BOXES
—PICKLING BASKETS

FABRICATORS OF
STEEL—IRON—BRASS—COPPER
—MONEL METAL

Requiring
Stamping—Forming—Drawing
Blanking—Punching

**See Data A.S.M.E. Mechanical Catalogue
McRae Hendricks and Thomas Catalogues**

STAMPINGS

Replace your small castings with more serviceable—less expensive stampings

Redevelopment work is one of the principal features of our business. Let us show you the savings we are making for manufacturers in automotive, furniture, and general metal goods lines by replacing small and medium castings with stampings. Lighter weight, better appearance and better prices are only part of the benefit you receive.

A drawing or sample with the approximate quantity required is all we need.

We also make WELDED RINGS and BANDS 6" to 60"

THE AKRON-SELLE CO.
AKRON OHIO
43 Years in Business

THESE BOSSERT STAMPINGS TAKE PUNISHMENT • • AND HOW!

Unbreakable tractor and road machinery parts that combine light weight with great strength

The punishment which tractor or road machinery service imposes on stampings is naturally far heavier than that encountered in most fields.

The fact that they are used widely under such trying conditions, indicates the inherent advantages of Bossert stampings wherever strains and shock are high, and weight and cost must be saved.

Bossert facilities are at your disposal to produce parts—large or small, heavy or light—in quantities, with assurance of fast delivery, at competitive prices.

Bossert engineers—widely experienced in the design of pressed metal parts—are freely available to assist in redesigning parts of your products which should be less costly, stronger, lighter and better looking.



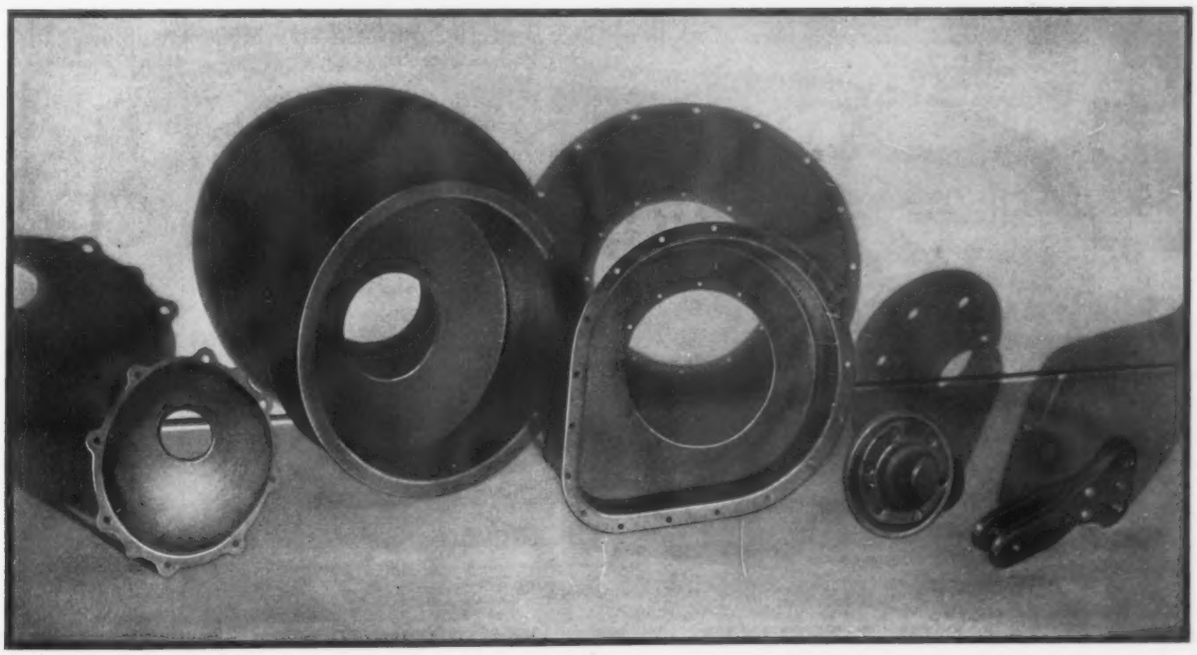
Send for book—
Metal Stampings

The Bossert book, Metal Stampings, which outlines briefly the various Bossert activities, is yours for the asking. Write for it.

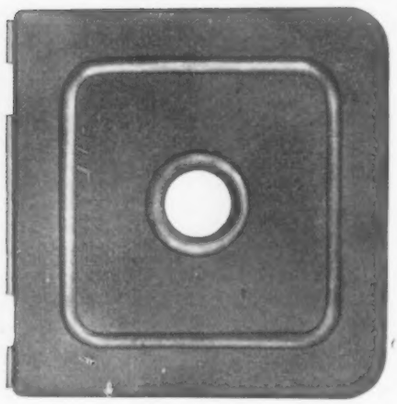
THE BOSSERT CORPORATION
Utica, New York
New York *Cleveland* *Detroit*



BOSSERT STAMPINGS



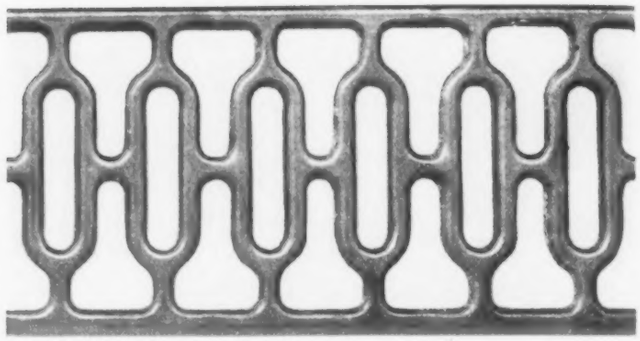
Why Worry



STOVE DOOR
1/16" Gauge Enameling Steel



STOVE LEGS
Various sizes from 8" to 22"
1/16" to 3/32" Enameling or Japanning Steel



ORNAMENTAL GRILLE—1/16" Gauge Steel

About Your Heavy Stampings--Put it up to PARISH

Many manufacturers have solved their heavy stamping problems, and freed themselves of the worry, by —putting it up to Parish.

If you have difficult stamping problems and are seeking ways and means of getting the kind of stampings you want, and at the same time lower the costs—just put it up to Parish.

Our engineers are ready and willing to cooperate with you in designing or redesigning of parts. We have facilities for making channels up to fifty feet long—small intricate parts — hot pressed forgings — heat treating parts up to forty feet long—machine shop for production work—and we make all of our own dies. For accurate, uniform stampings—try Parish.

[Heavy Gauge Stampings - Press Forgings
Heat Treated Bus and Truck Frames]

PUT IT UP TO *Parish*

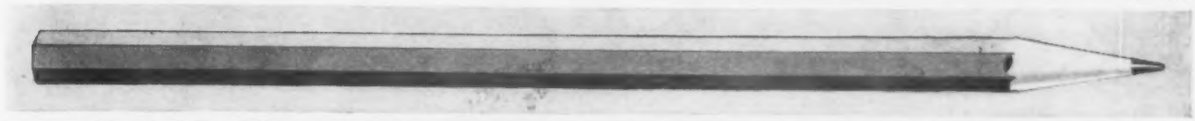
PRESSED STEEL CO.
of READING, PA.

Pacific Coast Representative F. SOMERS PETERSON CO.,
57 California St., San Francisco, Cal.

ASSOCIATED **Spicer** COMPANIES

BROWN-LIPE	PARISH	SALISBURY	SPICER
CLUTCHES and TRANSMISSIONS	FRAMES AND STAMPINGS	FRONT and REAR AXLES	UNIVERSAL JOINTS
BROWN-LIPE GEAR CO. SYRACUSE, NEW YORK	PARISH PRESSED STEEL CO. READING PENNA.	SPICER MFG. CORP. TOLEDO OHIO	SPICER MFG. CORP. TOLEDO OHIO

PENCIL TO PAPER



PRESS TO STEEL

AND MANUFACTURING COSTS TAKE A WELCOME CUT



Cast Iron Fan Housing. Weight 24.5 pounds.



Pressed Steel brought increased strength, breakage insurance, no machining, better finish and less friction in the air chamber of the finished product.



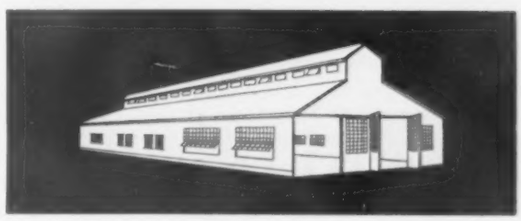
Pressed Steel fan housing. Weight 8.5 pounds.

THE pencil of the Pressed Steel Redesign Engineer produces startling results when the redesign of your products is under consideration. Lower initial cost of parts, ranging from 9% to 25% . . . less machining . . . reduction of finishing costs . . . no breakage losses . . . no misfit parts . . . lower handling costs . . . lower freight rates . . . these are but a few of the factors he has in mind in your product's reconstruction.

The manufacturer of the oil burner illustrated has a clear conception of the saving pressed steel can effect—i.e. the weight of the 24.5 pound fan housing was reduced to 8.5 pounds . . . a 65% weight reduction that was actually translated into 30% production savings.

It will be well worth your while to have a Pressed Steel Redesign Engineer look over your products—if not in whole, even some part, when pressed from steel will effectively reduce your manufacturing costs and improve your product's efficiency and appearance. We will be glad to put you in touch with such men. Their advisory service puts you under no obligation. Trade Research Division, National Association of Flat Rolled Steel Manufacturers, 511 Terminal Tower, Cleveland, Ohio.





Steel buildings save money, construction costs and time. Incombustible, salvable and adaptable to all needs.

Save



with Pressed Steel

Ability

Our ability to successfully fulfill difficult stamping requirements has led many of America's foremost firms to our door.

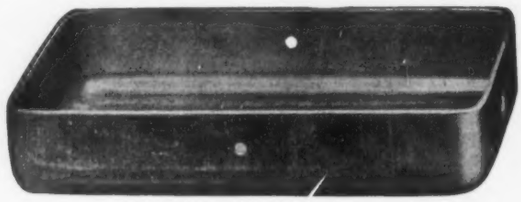
If it's anything in stamped metal we can handle it. Have you a difficult problem?

Worcester Stamped Metal Company

Successors to W. & S. Mfg. Co.
Established 1883

Worcester, Massachusetts

Philadelphia Representative:
H. L. Hess Co., 6816 Market St.



WORCESTER STAMPED METAL ©
· QUALITY · STAMPINGS



"Bridgeport"

STAMPINGS

BRASS
BRONZE · COPPER
AND ALUMINUM

Rough, semi-finished, finished or assembled. Complete engineering service, unlimited facilities for producing and assembling. Send drawings, blue prints, or samples for quotations.

BRIDGEPORT BRASS CO.
BRIDGEPORT, CONN.

SHEET METAL WORK

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OUR facilities consist of shearing and forming equipment up to 10' and 3/16", large number of presses, spot welders, oxy-acetylene and arc welders, also very complete japanning equipment.

Plant is now specializing in automotive sheet metal work.

Send us drawings or samples for prices

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C. HAGER & SONS HINGE MFG. CO.
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Complete Plant
Over 30 Years' Experience

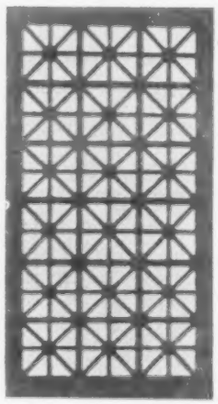
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MULLINS for STAMPINGS

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MAIN OFFICE AND WORKS—SALEM, OHIO
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If a company in your line has found a better way of doing a thing, the probabilities are that your business paper tells about it.



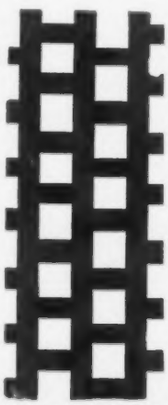
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Our plant is equipped to handle the most intricate orders . . . large or small . . . Diamond Perforated Metal Products are unsurpassed!

Get in touch with us before you place your next order . . . we'll meet your delivery date, give you a better job — at the right price!

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DIAMOND MFG. CO.

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Copper, Bronze, Steel, Brass, Tin, Aluminum—constantly on hand, ready to punch into any variety or kind of screen.

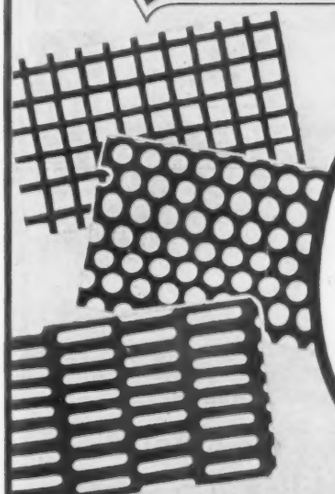
We have manufactured Perforated Metal for 61 years. We know our product thoroughly. We know your needs and are prepared to fill them.

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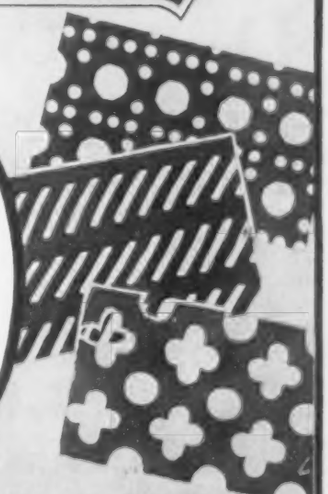


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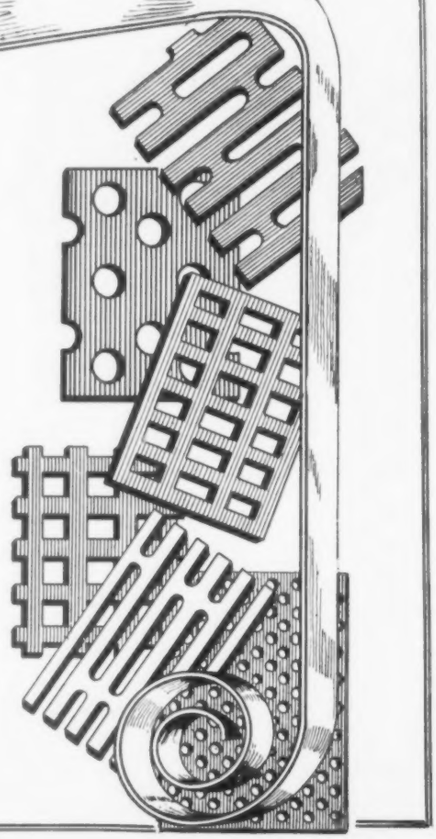
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Makers of Mitco Interlocked Steel Grating, Mitco Shur-Site Treads, Mitco Armorgrids and Elevator Buckets of all types.

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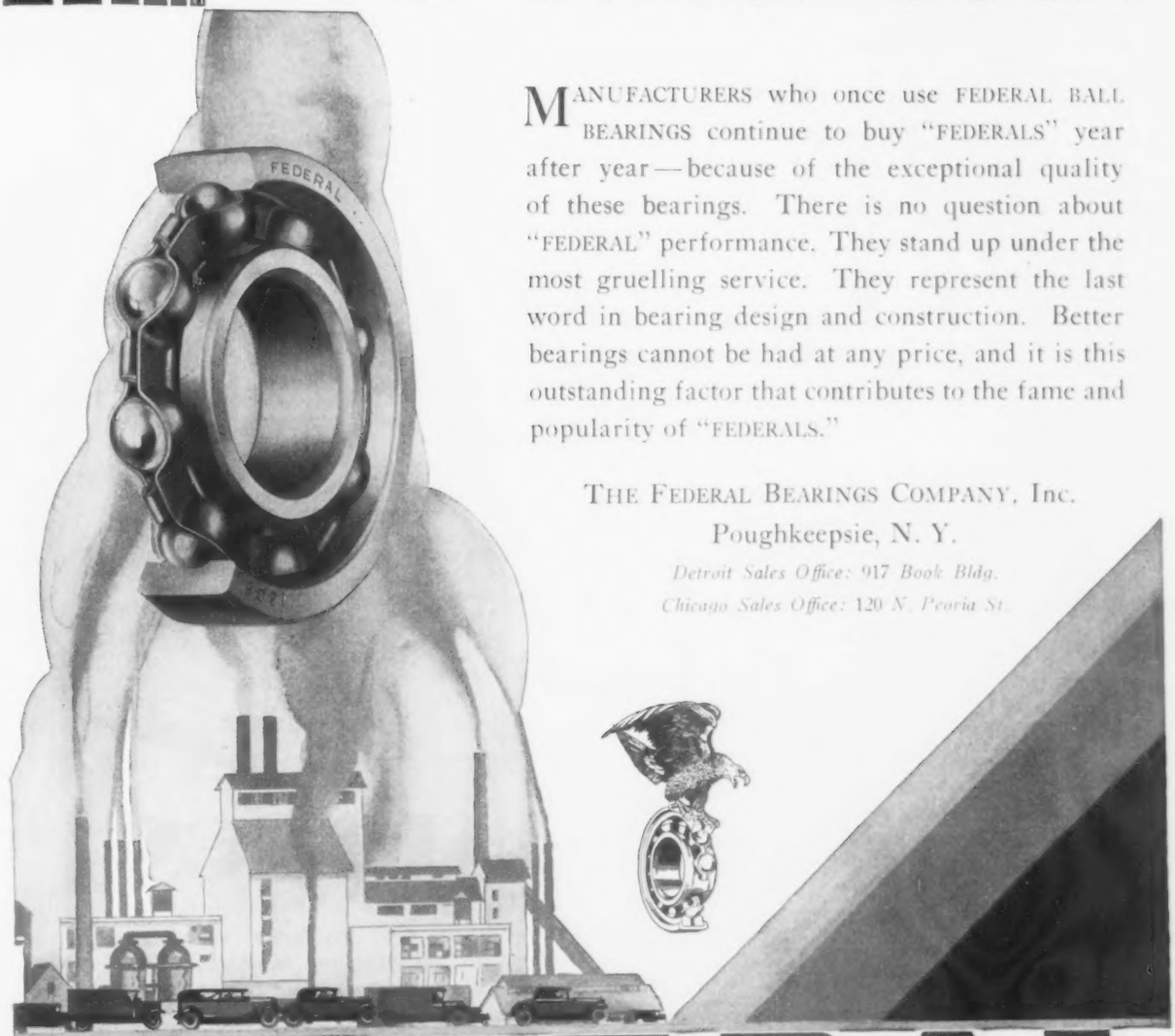




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Users of Bearings Buy FEDERALS Year After Year

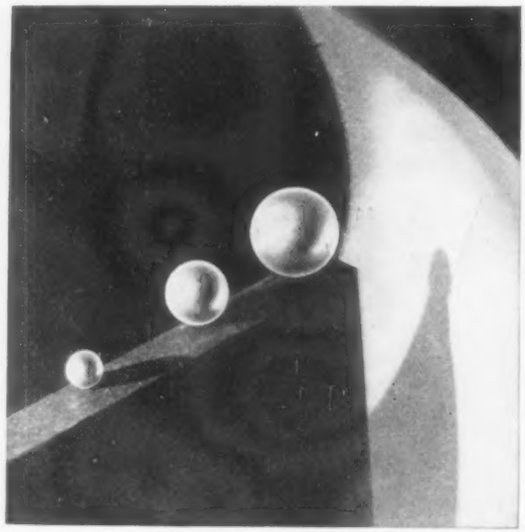


MANUFACTURERS who once use FEDERAL BALL BEARINGS continue to buy "FEDERALS" year after year—because of the exceptional quality of these bearings. There is no question about "FEDERAL" performance. They stand up under the most gruelling service. They represent the last word in bearing design and construction. Better bearings cannot be had at any price, and it is this outstanding factor that contributes to the fame and popularity of "FEDERALS."

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You insist on bearing balls characterized by

UNIFORM DEPENDABILITY
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AND SPHERICITY

THEN—

To be assured of these qualities, send your orders to

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DEPENDABLE FOR TWENTY-ONE YEARS

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FINISHED
STOCK BUSHINGS
Send for stock card
BRONZE BARS
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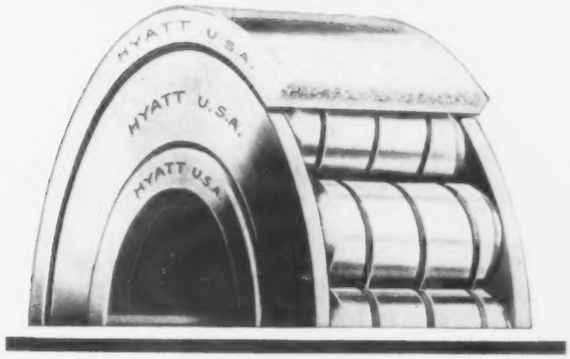
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A graphited bearing with a special groove — particularly adaptable to pulleys, clutches, brakes, or any machine where self-lubrication is desired.

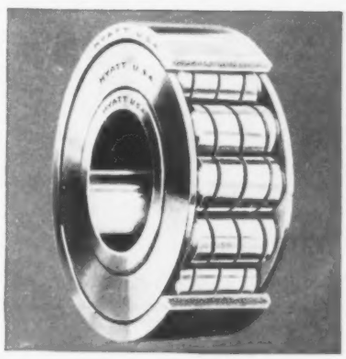
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The mark "Hyatt U.S.A." on inner and outer race and roller assembly of Hyatt bearings is your security of dependable bearing performance.

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By all means employ Hyatt bearings in the equipment you build or use . . . but refuse any compromise. "Hyatt U. S. A." is your protection.

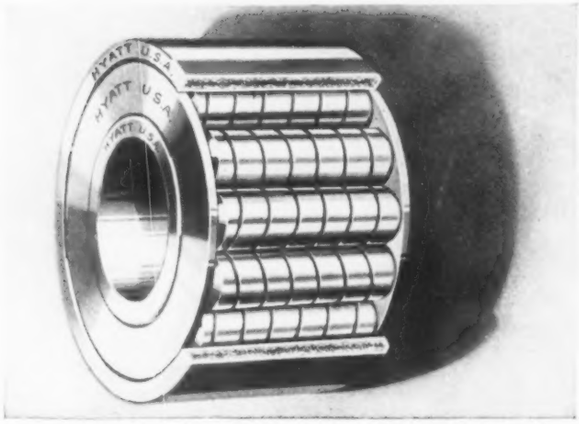
HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Oakland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS



Hyatt Roller Bearing with outer race cut away to show distinctive and sturdy roller construction.

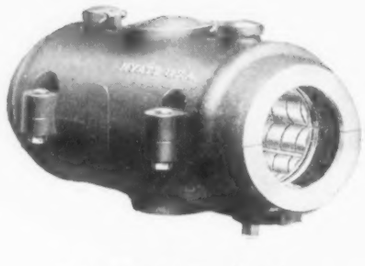
Brutes for punishment...bears for work

Endurance beyond the usual service requirements...brawn to stand them continuously are inherent qualities of Hyatt Roller Bearings.

Shocks of ponderous loading, conveying, handling... the severe impositions of crane manipulation... the better, smoother, longer operation of all mechanical equipment... these are the assignments which to Hyatts are all in a day's work.

And even after long, hard years of bearing the brunt of such exacting service, Hyatts carry on without deviation from their original flawless operation. Meanwhile they have been effecting many economies... saving time... reducing maintenance and attention... prolonging equipment life... speeding and safeguarding the profitable flow of production.

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There are two million Hyatt Line-Shaft Bearings serving industry today. Ask your mill supply dealer about them or write us for further data.

HYATT ROLLER BEARING COMPANY

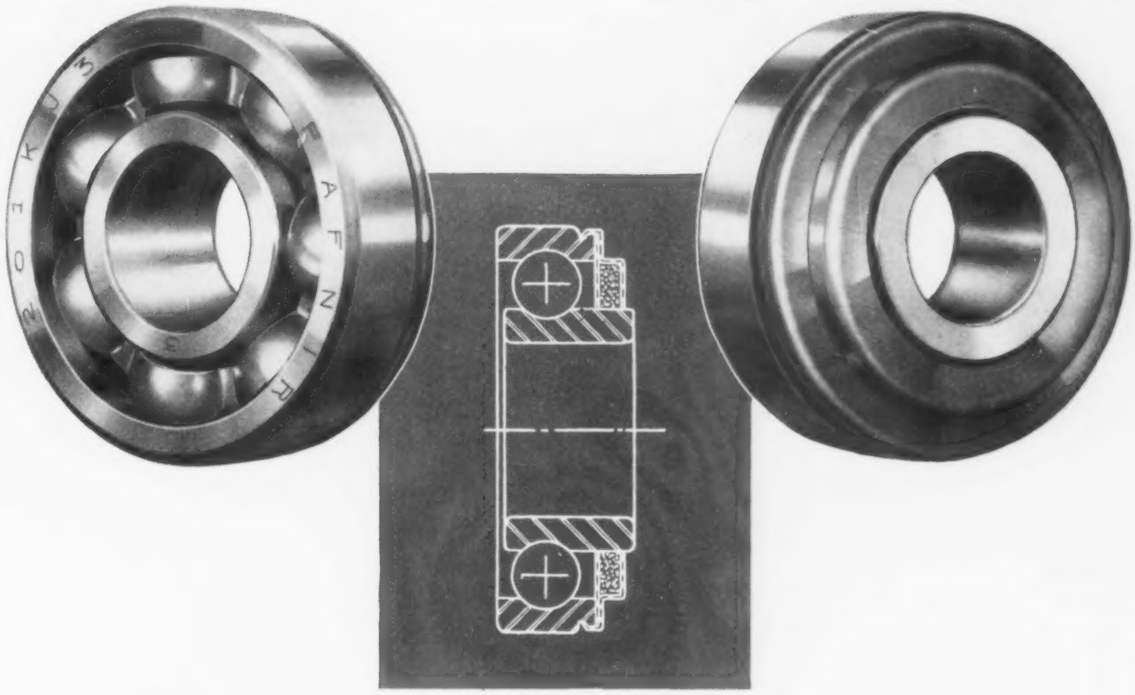
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HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

FAFNIR FELT-SEAL BALL BEARINGS



Self-Sealed! for *long life*

....for *compactness* ...for *simplicity of design*

NOW manufacturers of small electric motors, pumps, portable tools, etc., are saved the cost of a separate closure. Assembly is easier and quicker; greater compactness is obtained. And Fafnir Felt-Seal Ball Bearings greatly prolong lubrication life.

Note how the pressed steel shell is permanently fitted over one side of the Fafnir Felt-Seal Bearing. Lubricant is effectively sealed in, but the hardened, ground surface of the outside bearing diameter is retained. Provision for a snug, accurate mounting remains a feature of this Fafnir development.

Designers and engineers will find innumerable cost-cutting applications for the Fafnir Felt-Seal Bearing. Except in width, it is interchangeable with the standard series, simplifying design. Write for folder and complete data.

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Atlanta Chicago Cleveland Dallas Detroit Milwaukee Newark New York Philadelphia

FAFNIR
BALL BEARINGS

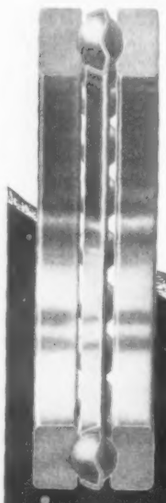


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Great American Names

Precision and quality in the parts which go to make up your machines are guardians of your own reputation and that of your product.

For many years the finest American Automobiles, whose very names are synonyms for reliability, have been using B. C. A. Ball Bearings.

B. C. A. Ball Bearings, of all types, are available in standard sizes, for industrial as well as automotive uses. They will safeguard the reputation of your machines just as they have been safeguarding the names of America's finest motor cars for thirty years.



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AUBURN
BALL BEARINGS
have exclusive features for answering bearing problems





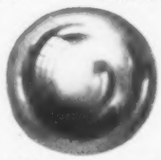
New T-114 RG Thrust

Type C Annular



Enclosed T-100 Thrust

Ball Bearings 7/16 to 26 inches diameter



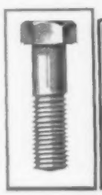
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AUBURN BALL BEARING CO.
Established 1893
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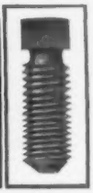
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also BRASS, BRONZE, COPPER and ALUMINUM CASTINGS
UP TO 2,000 POUNDS
It is the company with special or unusual requirements that we can please best. Estimates upon request.
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SCREW MACHINE PRODUCTS
CAP AND SET SCREWS
Wm. H. Ottemiller Co., Inc.
PATTISON ST. & M. & P. R. R. YORK, PA.



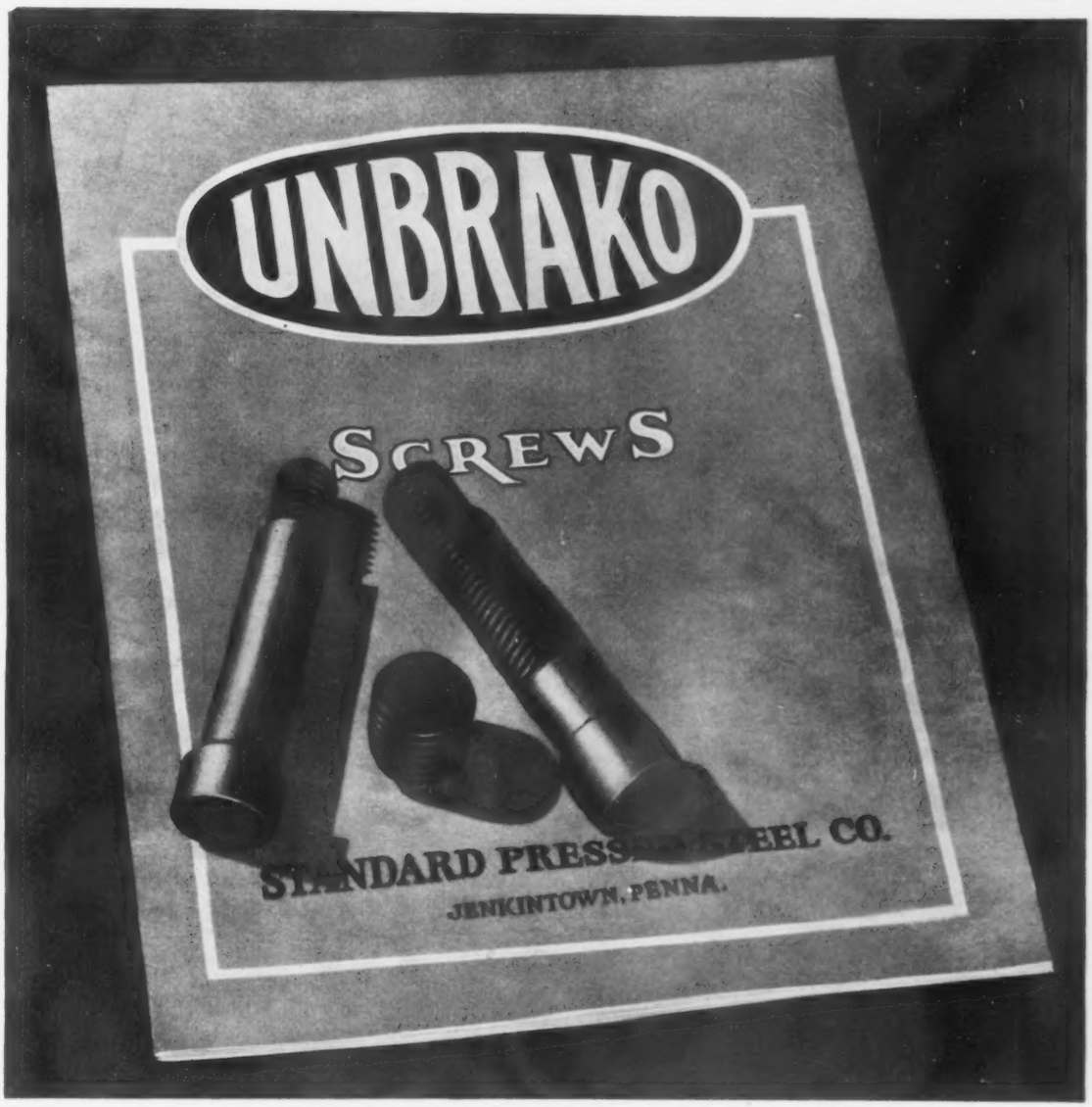
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SCREW MACHINE PRODUCTS
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SCREW MACHINE PRODUCTS
ACCURATELY MADE AT A FAIR PRICE ARE MORE ECONOMICAL
Specialists in the production of screw machine products for 15 years. Let us quote on your requirements.
Screw Machine Products Corp., 1014 Eddy St., Providence, R. I.



The picture shows from left to right: An **Unbrako** Stripper Bolt, an **Unbrako** Hollow Set Screw, and an **Unbrako** Socket Head Cap Screw on our **Unbrako** Screw Bulletin

281,527 LBS. PER SQ. INCH HAVE ACTUALLY BEEN RECORDED ON A TINIUS OLSEN TESTING MACHINE as the ultimate tensile strength of "UNBRAKO" Screws.

While the picture can't possibly show the tensile strength—on the other hand it can and does show the beautiful finish, the perfect threads, and the evident high quality of "UNBRAKO" Screws.

And as for hardness—a new file won't even scratch the "UNBRAKO."

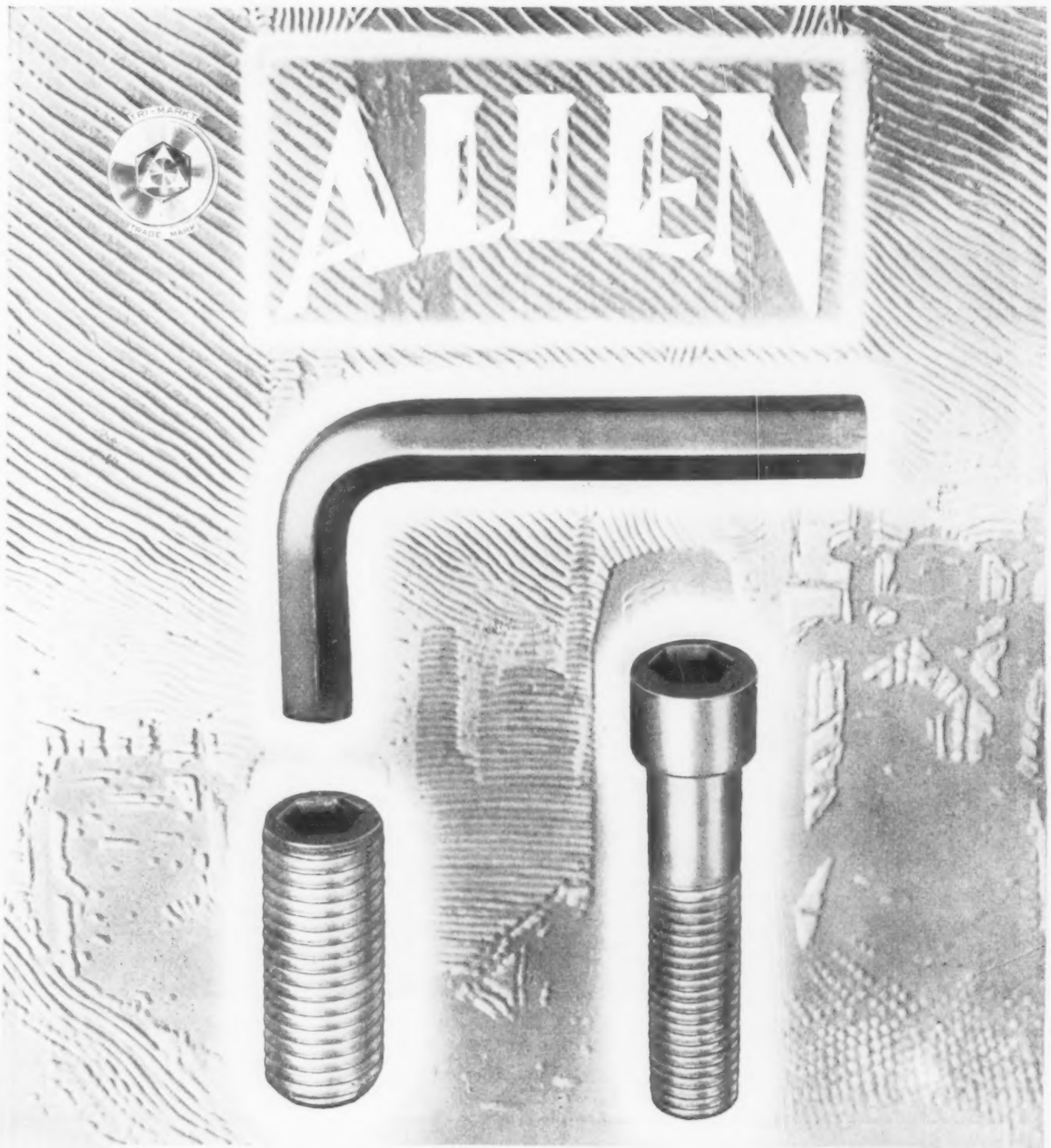
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STANDARD PRESSED STEEL CO.

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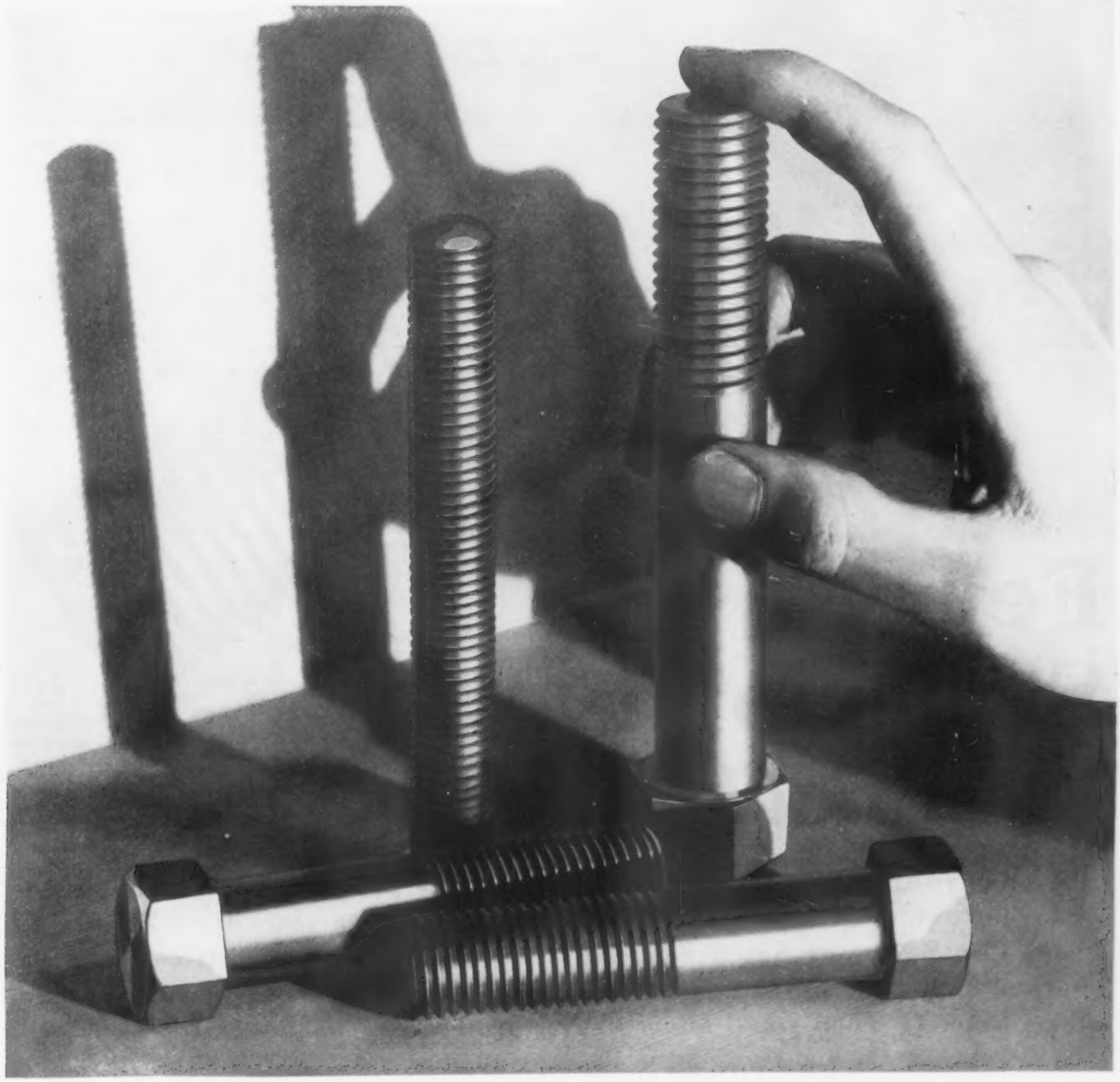


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Better cap screws—a result of untiring effort



THERE is no short cut to the manufacture of a fine cap screw aside from that which comes from greater accuracy and efficiency of the machines on which they are made. Today, by the Kaufman Method, *patented,* threads can be rolled which are considerably stronger, and much more accurate than was possible before at such speed in production. The Kaufman Method of extrusion is in itself a development of many years of effort. Users say it is worth while.

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Just look in a Ferry Package



√ *Head completely machined, top and bottom.*

√ *Accurate body. Smooth, perfect finish.*

√ *Clean cut, smooth and true hexagon face.*

√ *Threads accurate and lasting.*

√ *Selected steel of scientifically determined toughness and hardness.*

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PATRONIZE FERRY JOBBERS
LOCATED EVERYWHERE
THEY CARRY COMPLETE STOCKS

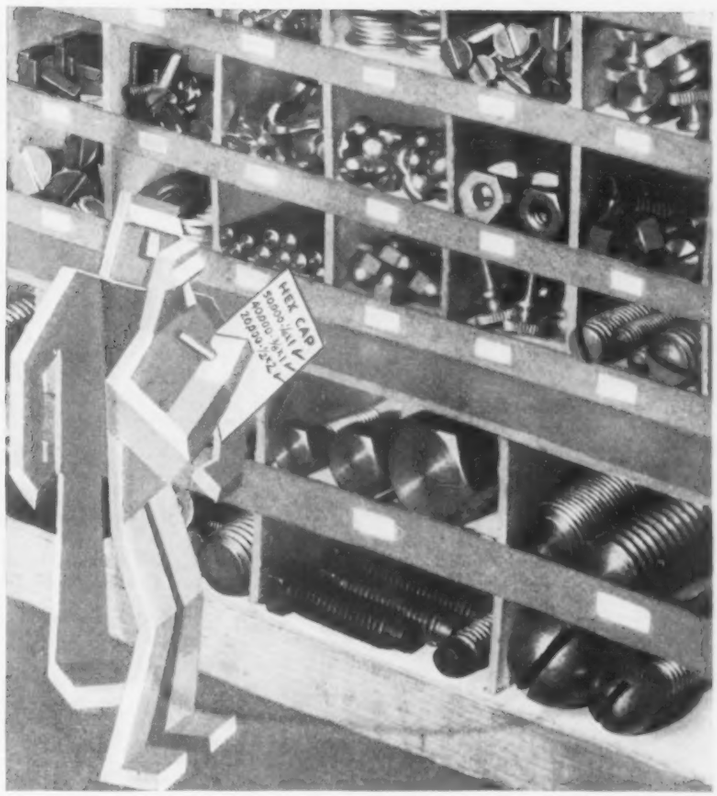
Ferry Superiority...
Checked at every point

MAKE your own comparisons—your own tests. Send for a sample Ferry Cap Screw or Set Screw and check it point for point against any other make. ¶ Then you'll *know* why Ferry is proud of an unusual record—twenty-three years of consistent effort to supply industry with cap screws, set screws, and other screw machine products of *unquestioned* superiority.

THE FERRY CAP & SET SCREW COMPANY
Cleveland, Ohio

FERRY
PROCESS SCREWS

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IF it's in stock anywhere, you'll find it at UNITED. Over 6,000 sizes and styles . . . almost unlimited quantities . . . immediate shipment from convenient warehouse stocks.

That's the UNITED story in a nut shell.

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Check the list at right and send us your inquiries.

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Machine — Cap — Binding
Knurled — Set — Special

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Special — Toggle
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WASHERS

Standard — Special
Hardened and Ground

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Machine Screw — Knurled
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Taper Pins — Studs
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All **UNITED** *Products are available in brass, steel or other metals*

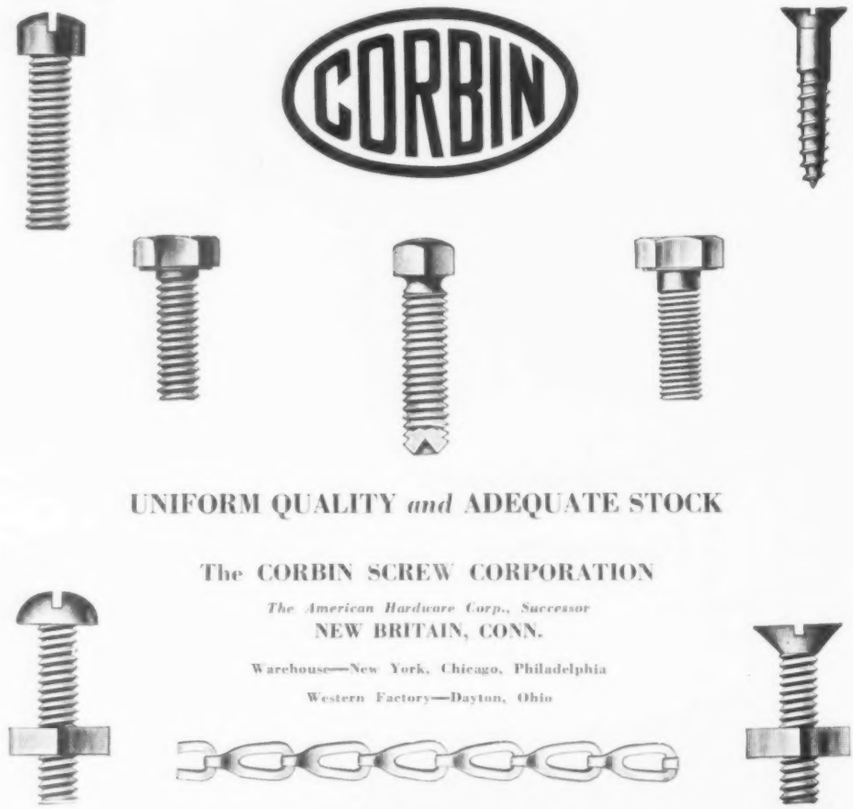
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CORBIN

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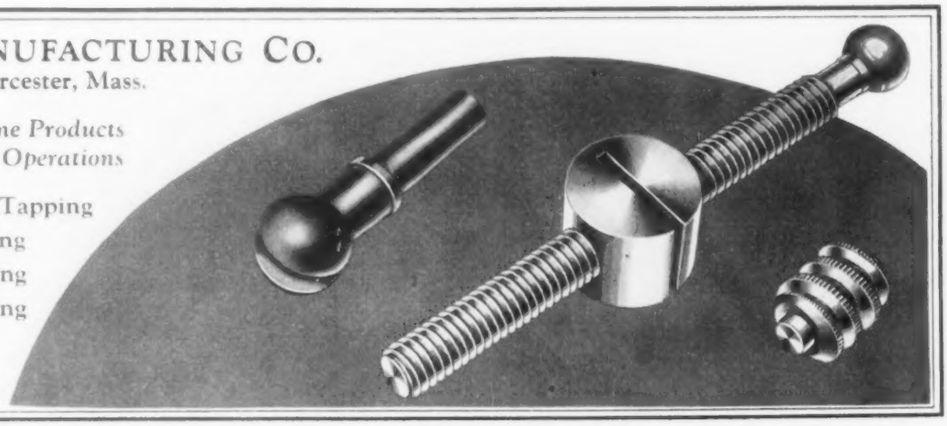
The CORBIN SCREW CORPORATION
The American Hardware Corp., Successor
NEW BRITAIN, CONN.
Warehouse—New York, Chicago, Philadelphia
Western Factory—Dayton, Ohio

OLSON MANUFACTURING CO.
Worcester, Mass.

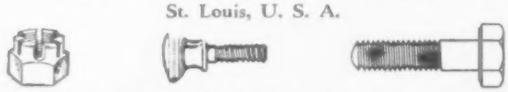
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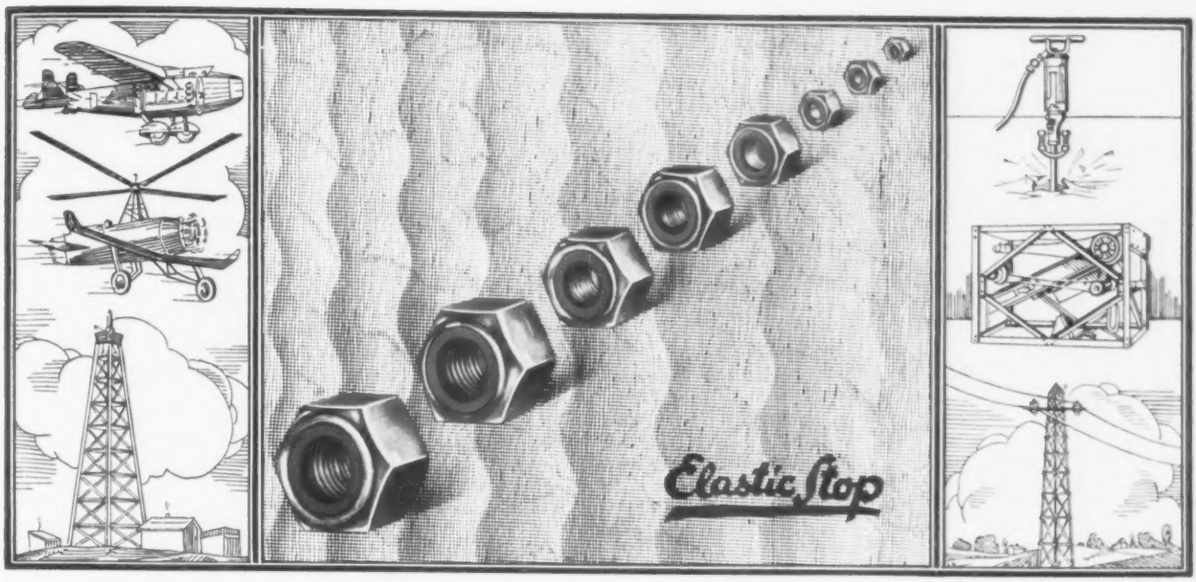
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St. Louis, U. S. A.



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BOLTS . . . NUTS . . . RIVETS . . . SCREW SPIKES . . . POLE LINE HARDWARE . . . TRACK BOLTS . . . PLAIN AND UPSET RODS . . . CAR AND GENERAL FORGINGS



THREE years ago the Elastic Stop Nut was "just another locknut" being introduced to the industry, grown somewhat skeptical on the whole subject.

Today Elastic Stop Nuts are accepted as a new standard by manufacturers of Rock Drills, Crushers, Sand Shakers, Well Drilling Equipment, Instruments, Airships and by the Airplane Industry, with the approval of the Department of Commerce.

The Elastic Stop Nut is a single foolproof unit standard nut, with height increased to incorporate a special fibre ring.

Performance alone is responsible for the acceptance of the Elastic Stop Nut by many of the country's leading manufacturers. Tests—not laboratory—but practical field tests on production quantities, have convinced engineers that this nut is good enough to be incorporated in products with national reputation.

The responsibility that this confidence implies has been met by manufacturing Elastic Stop Nuts under closest supervision and inspection.

Elastic Stop Nuts in all standard thread systems from No. 6/32 to 2½ inches are carried in stock.

Write for information and technical data.

SOME USERS

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CHICAGO PNEUMATIC TOOL COMPANY
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Manufactured by **AGA CO.** **Elizabeth, N. J.**



Reed & Prince Screws, Nuts, Bolts and Specialties are exactly what you want in accuracy, strength and material or finish — steel, brass, bronze, Everdur, Monel, Stainless and other special alloys and plain, polished, nickel, copper, blued, galvanized, cadmium or chromium finishes. A production organization thoroughly equipped and up-to-date in every respect assures right prices, prompt service and lasting satisfaction.

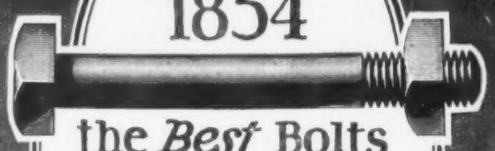
Whether it's a carton or a carload, specify Reed & Prince products.

REED & PRINCE MFG. CO.
WORCESTER, MASS., U.S.A.
WESTERN BRANCH AT CHICAGO, 3635 IRON ST.



1385

Back in 1854



the *Best* Bolts were made by

Clark Bros. up in Conn. They are still making the Best because they have had the experience and realize the real demand for such a quality product.

A size and type for every use. Send for a sample.

CLARK BROS. BOLT CO.
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BOLTS — TRACK, MACHINE
SPIKES — TRACK, BOAT, DOCK, GUARD
BARS — IRON, STEEL

EST. 1859 **W. AMES & CO.** FACTORY & OFFICE JERSEY CITY, N.J.

STANDARD and SPECIAL



NUTS

MILLED FROM BAR

WESTFIELD NUT COMPANY WESTFIELD, MASS.

THUMB NUTS and THUMB SCREWS
MALLEABLE IRON



Formerly made by
Thomas
Devlin Mfg. Co.
Philadelphia



We carry a large stock and variety of styles and sizes of thumb nuts and thumb screws, threaded and blank.

Malleable and Grey Iron Castings

Philadelphia Hardware & Malleable Iron Works, Inc.
State Road and Shelmire St., Tacony, Philadelphia, Pa.



PLENTY MORE WHERE THESE CAME FROM

And Made to Order to Suit You

It is perfectly obvious that small gears, pinions and special shapes can be sliced from the bar more cheaply than they can be individually cut from the solid. That is providing other things are equal—the shapes uniformly accurate, the metal right, the initial cost low. Here at the Rathbone plant we take every precaution to guarantee them so.

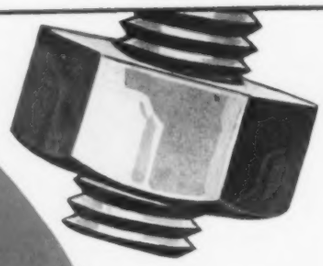
Many manufacturers are now eliminating a number of special operations—saving time, simplifying their assembly, holding their assembly to greater uniformity, because they took up with Rathbone engineers the comparative costs of both ways. That is the basis of our success with other firms, and on this basis have we built a large business.

Rathbone shapes are made in bronze, brass, steel, nickel silver and other metals and are available in a number of standard shapes as well as in the special shapes developed to your specifications.

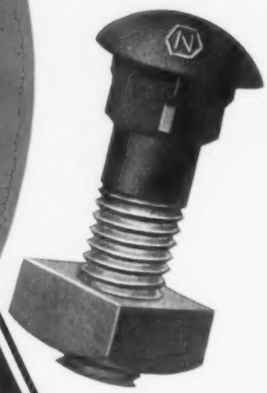
If the cost of your small parts bulks large in proportion to your total costs, we can show the way to economies that will be worth your while. Let us demonstrate.

A. B. & J. RATHBONE

PALMER, MASS.



Neely



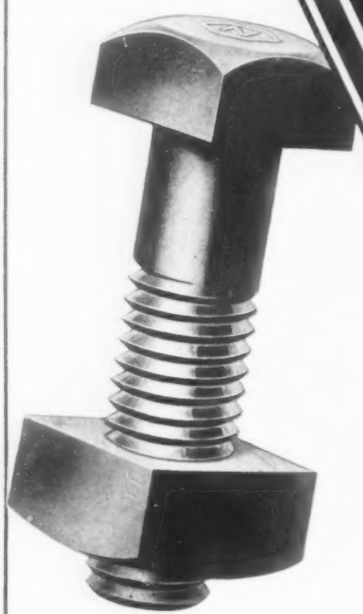
NOTED FOR QUALITY SINCE 1881

BOLTS

CARRIAGE, MACHINE—All diameters and lengths . . . LAG Gimlet or Cone Point . . . GALVANIZED SPECIALS OF ALL KINDS—Including Bolts made from Monel Metal, Rustless Iron or Steel and Bronze . . . TRACK, COMMON CARBON (Not Heat Treated) . . . FOUNDATION . . . U, EYE and HOOK . . . STUD—Open Hearth, or Alloy Steel, Heat Treated . . . FROG AND SWITCH—Open Hearth, or Alloy Steel, Heat Treated.

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COLD PRESSED, ALL SIZES—Chamfered, Trimmed and Reamed . . . HOT PRESSED—Square and Hexagon, Hexagon Jam Nuts, Stirrup Nuts for Steamboats, Frog and Switch Nuts . . . SEMI-FINISHED—U. S. S. and S. A. E. Plain, Case Hardened, Special Sizes (All Milled from Cold Drawn Hexagon Steel Bars).



RIVETS

BOILER AND STRUCTURAL—All types ½" diameter and larger.

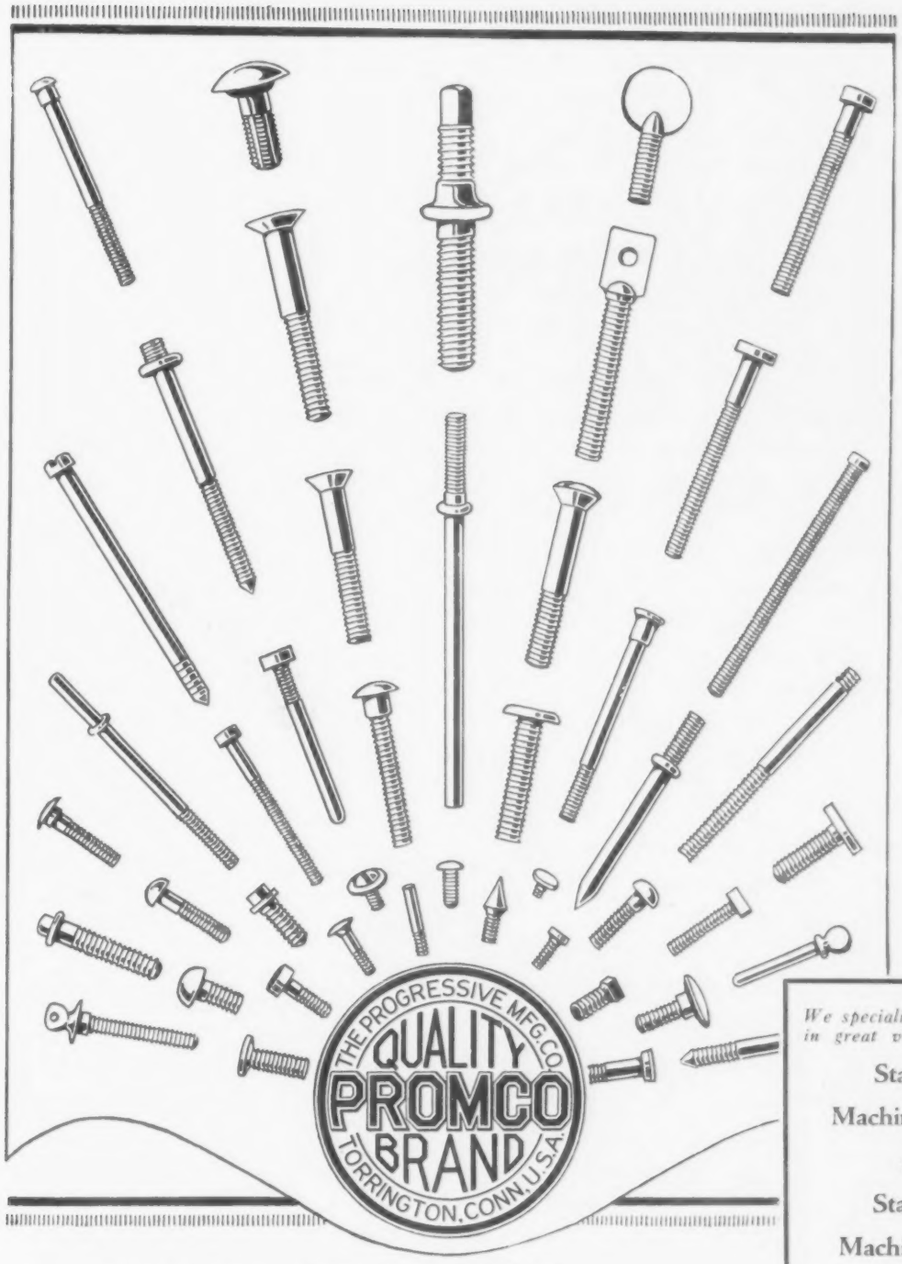
RODS

PLAIN AND UPSET

UPSET FORGINGS

MADE FROM MONEL METAL, RUSTLESS IRON OR STEEL, BRONZE AND SPECIAL ALLOY STEELS.

NEELY NUT & BOLT CO. PITTSBURGH, PA.



RIVETS

To order only

Bright Steel

Brass

Copper

Naval Brass

Bronze

Nickel Alloys

Monel Metal

Aluminum

Nickel Silver

We specialize in and stock in great volume

Standard

Machine Screws

and

Standard

Machine Screw

Nuts

"American" approved standard threads on all standard products.

COLD HEADING

Compare our prices on cold headed products with those milled from the bar. By means of the most modern machinery we greatly lower the cost of all products that lend themselves to the cold heading process.

If you will send blueprints or specimen parts, our staff of specialists will be very glad to give you a cost comparison.

There is a favorable cost comparison on all our products, and their uniformity of manufacture ensures you against slowing down in your assembly operations.

THE PROGRESSIVE MANUFACTURING COMPANY

The House of Service TORRINGTON, CONN. *The House of Service*

RHODE ISLAND TOOL COMPANY

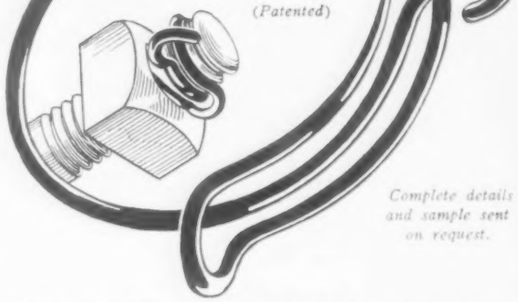
(ESTABLISHED 1834)

NUTS — BOLTS — SCREWS — WRENCHES
SCREW MACHINE PRODUCTS
DROP FORGINGS

SEND US YOUR SPECIFICATIONS

PROVIDENCE - - - - RHODE ISLAND

Labbe
WEDGE
NUT LOCK
(Patented)



Complete details and sample sent on request.

THE NUT LOCK THAT LOCKS

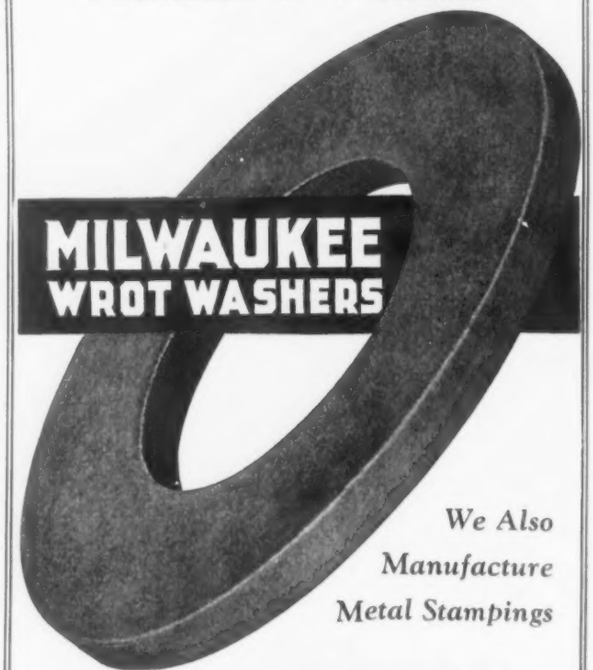
TIGHTEN nut with wrench, move Lock up to and under the nut and your troubles are over—safe, efficient, economical.

Unaffected by vibration, corrosion-proof. All sizes for standard threads in variances of 1/8 inch, 1/4" to 1 3/4" inclusive.

Test it yourself—under any and all conditions.

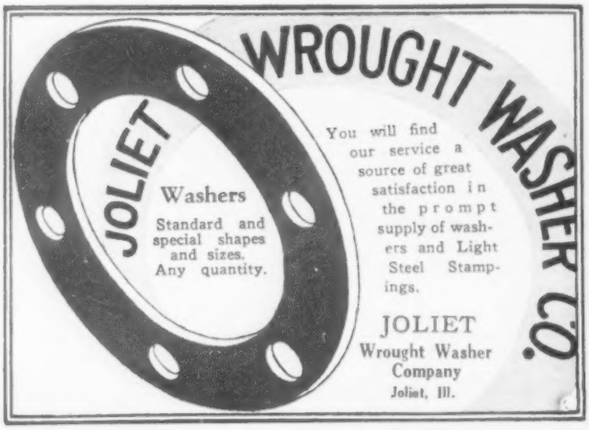
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1235 South Broadway — Denver, Colo.

"The World's Largest Producer of Washers"



We Also Manufacture Metal Stampings

WROUGHT WASHER MFG. CO.
Established 1887
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You will find our service a source of great satisfaction in the prompt supply of washers and Light Steel Stampings.

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THE MASTER PRODUCTS CO.
6420 PARK AVE., S.E. CLEVELAND, O.



81 YEARS
Under the Same Management

ESTABLISHED 1850

Founded ten years before the Civil War, this business has grown to its present position of leadership under one management . . . whose policy it has been to constantly make a good product and to serve customers honestly.

As specialists in a field of small, but very important products in many assemblies, we have shown a number of firms the way to greater production economies.

RIVETS, ESCUTCHEON PINS, WIRE NAILS, DRIVE SCREWS, HEADED and EXTRUDED WORK from WIRE are our specialty.

Rivets and wire nails are made to order only, in all metals — iron, brass, copper, nickel silver, aluminum, lead, monel metal, stainless steel, etc.

These small products have played a major part in building and maintaining many reputations.

Rivets

Escutcheon Pins

Special Wire Nails

Drive Screws

The continuation of our present policies will keep us abreast of progress and enable us to meet your future requirements.

Special Headed and Extruded Work from Wire

JOHN HASSALL, INC.

CLAY AND OAKLAND STREETS

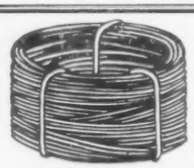
BROOKLYN, N. Y.

WASHBURN Wire

Piano Wire — Phonograph Needle Wire
Music Spring Wire — Vanadium Wire
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Cold Rolled Strip, 3″ and narrower
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STEEL MUSIC WIRE N.Y. — EAGLE BRAND — WASHBURN WIRE CO. INC. — 020

WASHBURN WIRE CO., INC.
118th St. & Harlem River — New York, N.Y.



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Wire, in all sizes, made from open hearth steel; bright, annealed, coppered, galvanized and tinned; coiled or straightened out, cut to length.

We also produce screen wire cloth, galvanized wire cloth, wire nails, brads and staples. Write your jobber for full information and prices.

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ENTIRE FACTORY AND OFFICES
CORTLAND, NEW YORK, U.S.A.

NICETOWN PLATE WASHER CO., Inc.
IRON AND STEEL BARS
DEFORMED STEEL BARS — THREADED RODS
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HOT GALVANIZED BARS AND WASHERS
JUNIATA AND CLARISSA STS.,
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HIGH CARBON
STEEL WIRE
JOHNSON STEEL & WIRE CO., Inc.
WORCESTER, MASS.

Woven Revolving Screen Jackets

have unobstructed open space enough to pass ALL undersizes.

Woven Screens have *More Holes per square foot* than other screening surfaces—20% to 40% more opportunities for passable sizes to escape from the crushing circuit.

In addition, because of scientific crimping, the rasping surface of the Woven Screen raises the load 50% higher on the rising cylinder wall; the resulting long cascade affords multiplied contact with the screen openings. The finer particles are segregated *toward the screening surfaces;* they reach the highest point before cascading, and cascade most slowly and in closest contact with the cylinder walls. The coarser particles are first to seek the trough of the cylinder, get first chance at the unobstructed openings, pass through instantly if of satisfactory size, or travel fastest with the pitch of the screen if too large to pass the openings.

"Getting Results with Ludlow-Saylor Screens" is a 200-page summary of America's latest achievements in screening practice and screen-control of process operations . . . A copy will be sent free upon request to any reader of The Iron Age

LUDLOW-SAYLOR WIRE CO.
600-610 S. Newstead Ave.
St. Louis, Mo.
Please send us Book No. 48-T "Getting Results."

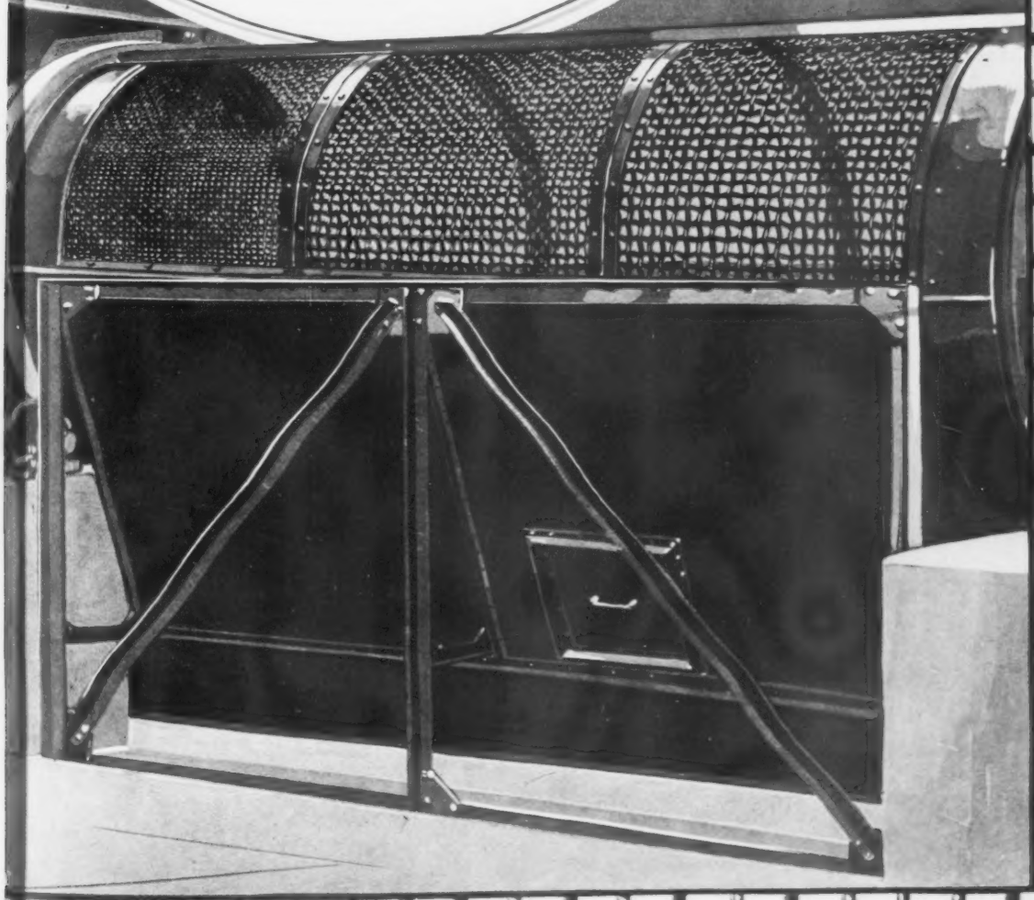
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The LUDLOW-SAYLOR WIRE COMPANY ST. LOUIS

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LUDLOW-SAYLOR WIRE CO.
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Please send us Book No. 48-T
"Getting Results."

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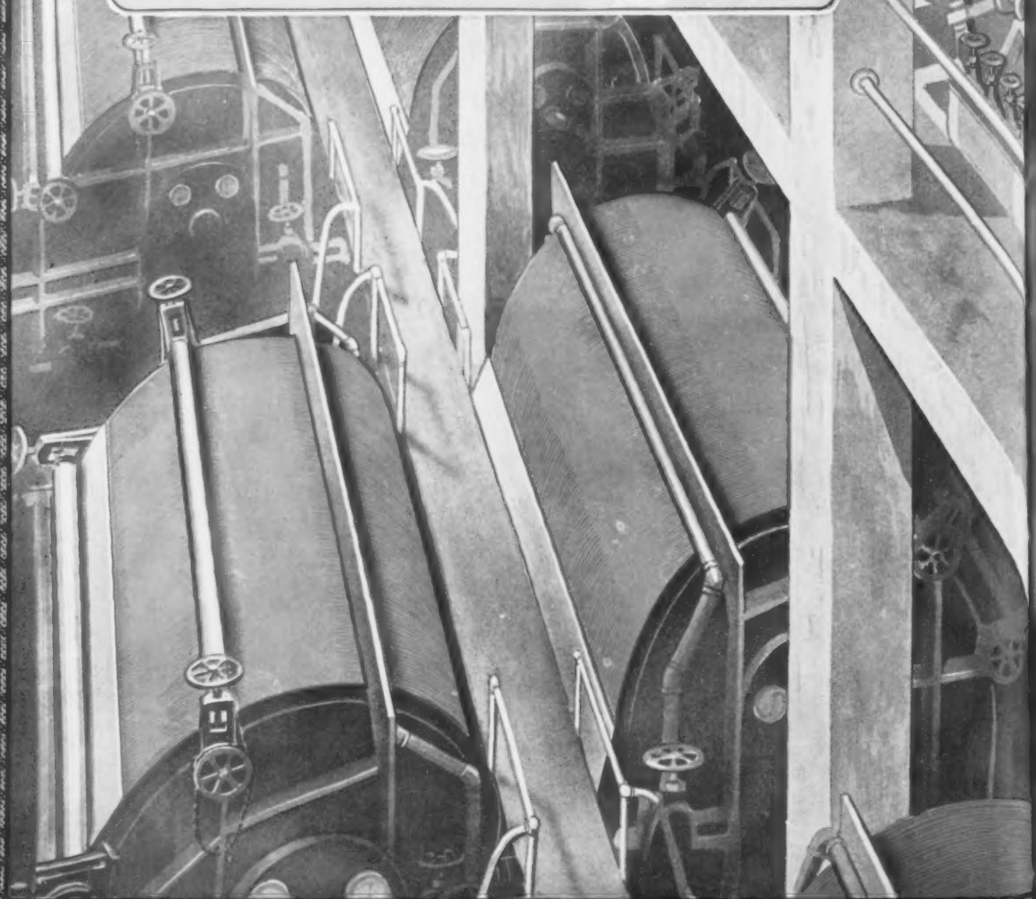
Wire Cloth of Phosphor Bronze, Brass, Copper, Monel, Aluminum

—any special metal, for any sort of service.

Tremendous Ludlow-Saylor stocks supply a thousand weights and weaves of Wire Cloth, in standard widths. Special requirements are quickly made to order.

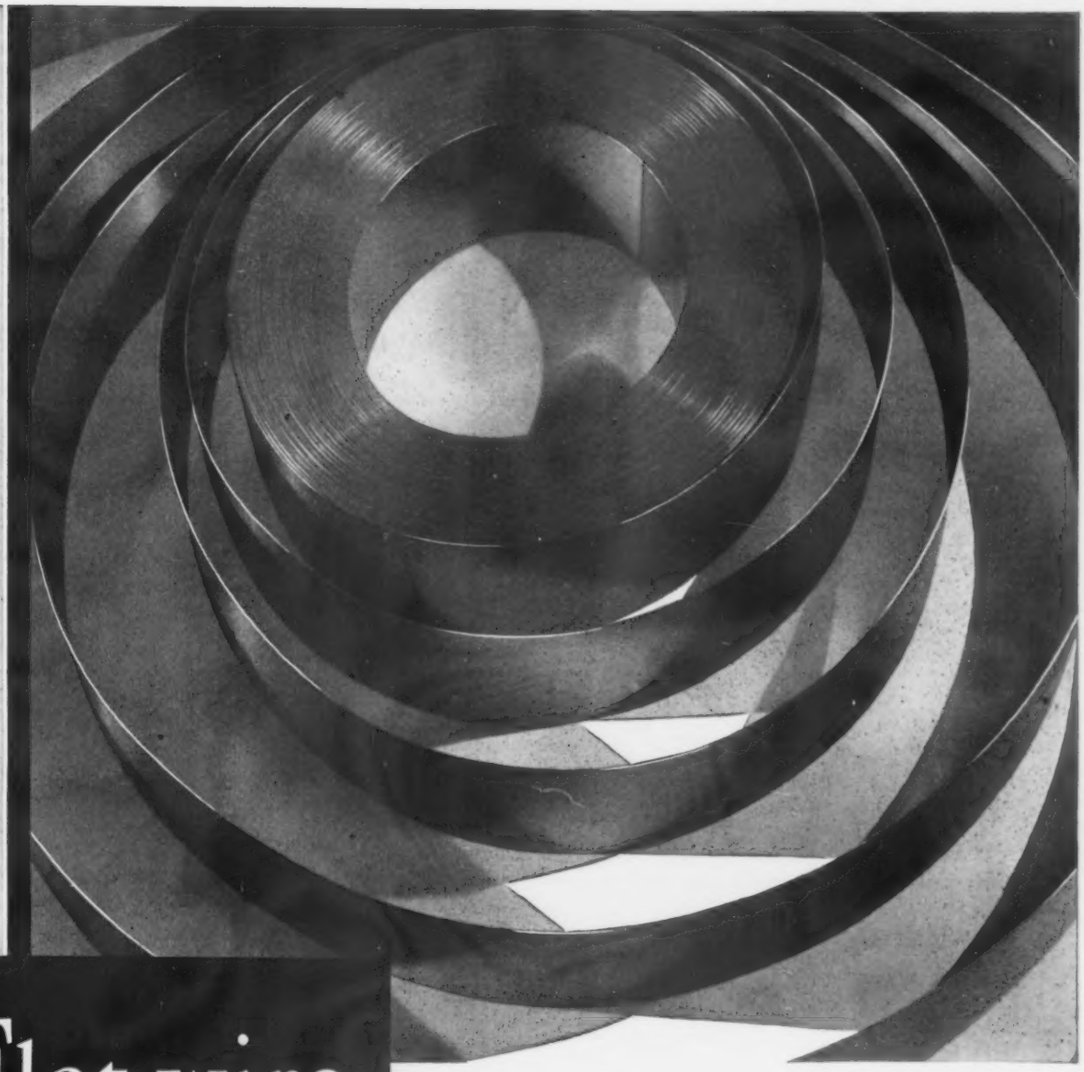
To meet any chemical or physical condition—heat, pressure, corrosion, vibration—special Wire Cloths can be provided to get the maximum productivity from plant and equipment investments.

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LUDLOW-SAYLOR WIRE COMPANY ST. LOUIS

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Flat wire for the *particular*

OUR customers order hundreds of different kinds of flat wire. But common to all of them is this fact:—they are particular.

We attract and hold "hard-to-please" customers because they find that we meet their most exacting flat wire requirements. For years we have specialized in flat wire of the very highest quality and have one of the largest flat wire plants in the country.

Cold rolled high or low carbon steel. Made in various widths, thicknesses and finishes including galvanized and tinned.

JOHN A. ROEBLING'S SONS CO., TRENTON, N. J.

WIRE • WIRE ROPE • WELDING WIRE • COPPER & INSULATED WIRES & CABLES

New York Chicago Philadelphia Atlanta Cleveland
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PRENTISS WIRES

SPECIALTIES IN WIRE DRAWN FROM SWEDES IRON, BESSEMER, OPEN HEARTH AND CRUCIBLE CAST STEEL. SPECIAL WIRES FROM CARBON STEELS OF PARTICULAR ANALYSES. ESTABLISHED IN 1857

GEO. W. PRENTISS & CO. HOLYOKE, MASS.

PAGE WIRE PRODUCTS

Spring wire - Fence - Welding wire - Plain *and* Galvanized wire - Strand - Special analysis wire

PAGE STEEL AND WIRE COMPANY
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District Offices: CHICAGO · NEW YORK · PITTSBURGH · SAN FRANCISCO
An Associate Company of the American Chain Company, Incorporated

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FORGED TURNBUCKLES

BABBITT LADLES — BELT STRETCHERS
UPSET AND BULLDOZER FORGINGS
NORRIS BROS., Inc. ROBINSON, ILL.

MUSIC WIRE

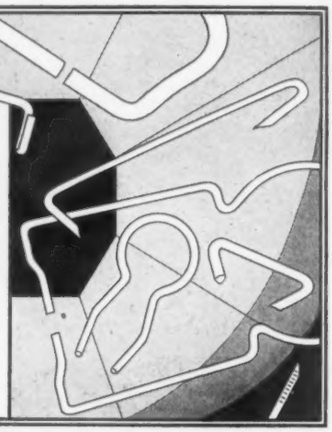
STRENGTH · UNIFORMITY · DURABILITY · FINISH

THE WEBB WIRE WORKS
NEW BRUNSWICK, N.J.

TITCHENER WIRE PRODUCTS

Handles, hooks, rings, staples, specialties cheaply and accurately made. Over 45 years' experience with quantity production. Write for prices.

E. H. TITCHENER & CO.
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WIRE FORMS

—the kind you want



Wire forms—any shape—any size—any quantity. We are prepared to give you prompt deliveries on accurately made pieces, in accordance with your specifications.

Send us a small initial order and see for yourself.

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Valley Falls, R. I., U. S. A.

SENECA
BRAND
WELDING WIRE
Uniform in Temper, Gauge, Finish & Analysis

IRON STEEL WIRE "SENECA" QUALITY

Seneca Products:

Fly Screen Wire Cloth – Straightened and Cut Wire – Welding Wire – Cold Rolled Flat Wire – Stapling Wire – Binding Wire – Weaving Wire – High Carbon Spring Wire – Cotter Pin Wire – Alloy Steel Wire to S.A.E. Specifications.



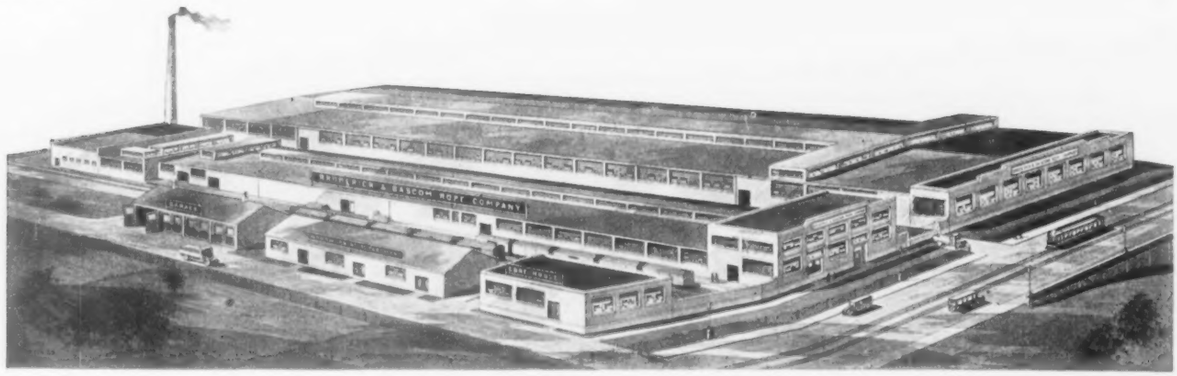
The Seneca Wire & Mfg. Company
ESTABLISHED 1905 FOSTORIA, OHIO

Hartshorn STEEL WIRE

NARROW FLAT WIRE	HARD DRAWN SPRING WIRE
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WIRE MILL LOCATED IN EAST NEWARK, N. J.

STEWART HARTSHORN COMPANY
MANUFACTURERS OF WIRE FOR FORTY YEARS
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Million Dollar Factory in St. Louis

Two Great Plants to Supply Every Need for Wire Rope

A huge million dollar plant in the heart of industrial St. Louis! And in Seattle, one of the finest and most productive factories on the whole Pacific Coast . . . Both devoted *exclusively* to the manufacture of high grade wire ropes, ranging from the famous, colossally strong, elastic Yellow Strand Wire Rope, to the simplest galvanized strand for guy lines . . . And in New York City a great warehouse carrying at all times ample stock of Broderick & Bascom Ropes in all grades, sizes and constructions . . . Authorized distributors in over one hundred and fifty cities in the United States. Also in many foreign countries . . . Our service is as dependable as our cables.

Write for Catalog No. 3 and name of your nearest distributor.

BRODERICK & BASCOM ROPE CO.

ST. LOUIS, MO.

Factories: St. Louis and Seattle

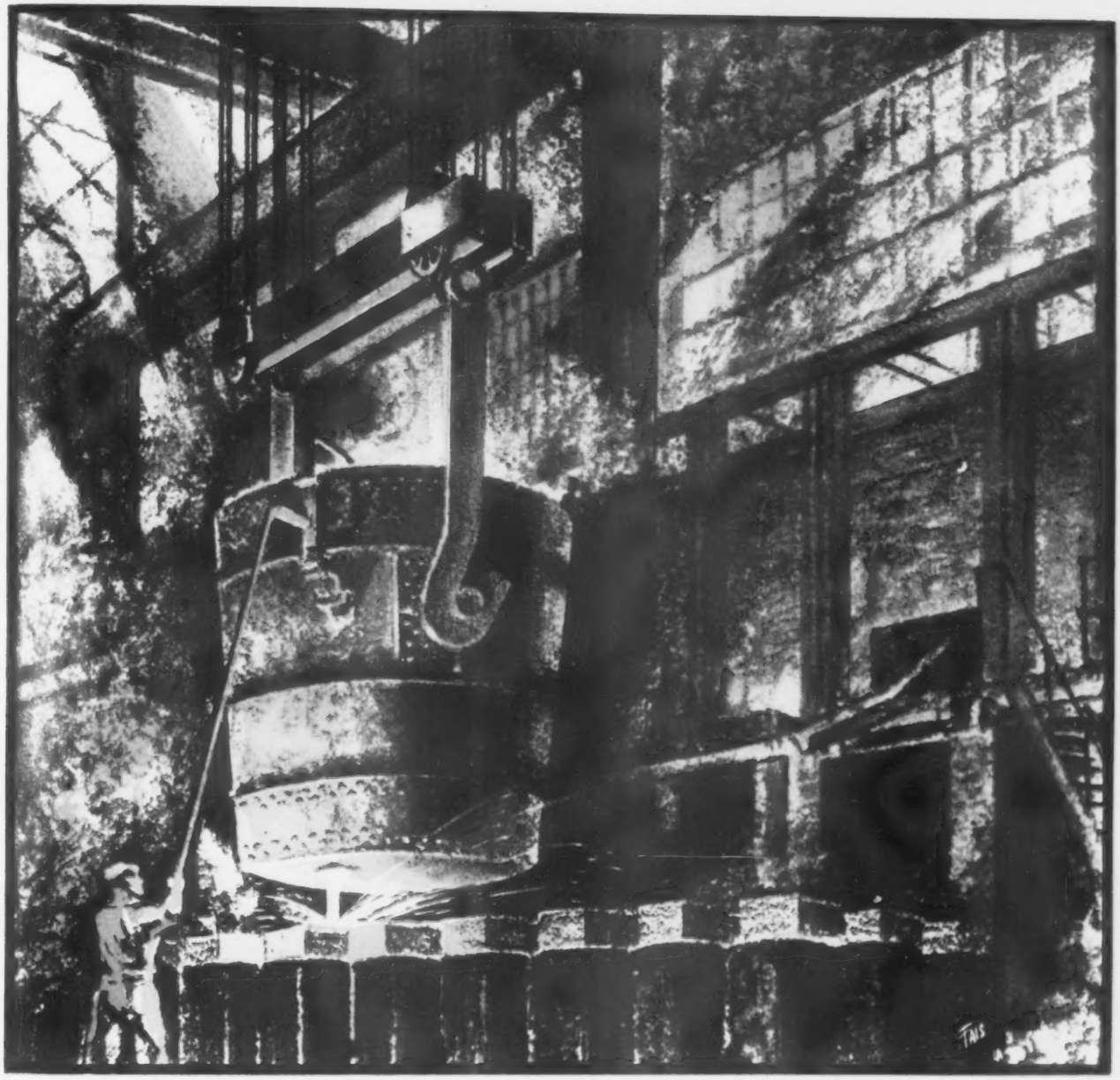
ESTABLISHED 1876

Eastern Office and Warehouse:
68 Washington St., New York City



Seattle Factory, one of finest on Pacific Coast

K772



Pouring a heat of acid steel

for Roebling Wire Rope

THE MOLTEN METAL has been tapped into a huge ladle. And now it is being poured into the molds. Soon, in the form of ingots, it will be on its way through a seemingly endless number of processes. Finally it will be shipped out as Roebling "Blue Center" Steel Wire Rope.

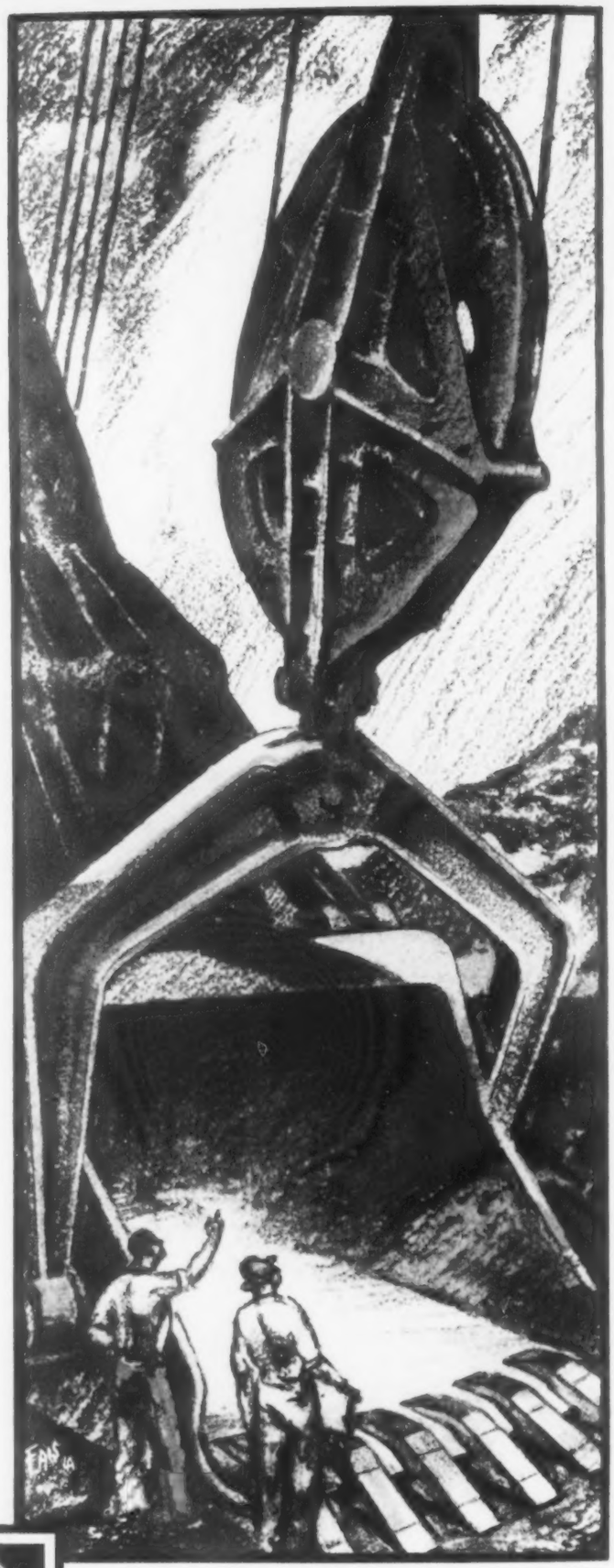
Roebling Quality starts with the making of the steel and is under Roebling control every step of the way. It is the result of highly developed, modern production methods plus close attention to detail.

Throughout the 48 states of the union, millions of feet of Roebling "Blue Center" Steel Wire Rope are daily demonstrating the safety and economy assured by Roebling Quality in every type of service.

ROEBLING "BLUE CENTER" STEEL **WIRE ROPE**

On this Giant Shovel

...''any'' wire rope won't do!



1600 TONS OF STEEL muscle and sinew! A crawling monster that annihilates mountains of material with incredible ease and swiftness. That can fill 20 trucks of ordinary size, with each disgorging of its cavernous dipper!

This, in substance, is the Roebling-equipped power shovel shown...operated by the United Electric Coal Companies.

Obviously, in rigging such a shovel, the selection of wire rope is a most important procedure. For the rope required must withstand exceptionally heavy stresses and strains ...and survive punishing service without faltering.

That the makers equipped this giant shovel with Roebling "Blue Center" Steel Wire Rope is deeply significant...and indicative of their confidence in its superiority.

JOHN A. ROEBLING'S SONS COMPANY
WIRE...WIRE ROPE...WELDING WIRE...FLAT WIRE
COPPER *and* INSULATED WIRES AND CABLES
TRENTON, NEW JERSEY
Branches in Principal Cities

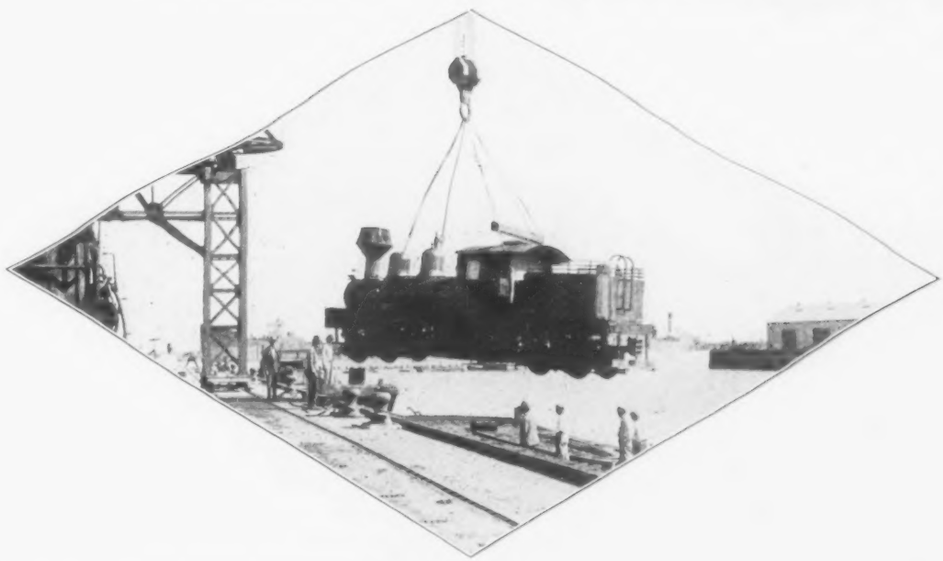
ROEBLING **WIRE ROPE**

"BLUE CENTER" STEEL

"HERCULES" RED-STRAND

REG. U.S. PAT. OFF.

WIRE ROPE



Strong Enough and Tough Enough for Hard Work of All Kinds

"HERCULES" (Red-Strand) Wire Rope is extra strong, yet its long life is not due to its strength alone, but to the fact that it is also able to stand a lot of bending and to offer great resistance to wear.

These vital qualities—in correct balance—are always present in "HERCULES" (Red-Strand) Wire Rope because it is made of acid open hearth steel wire, and because every wire used is first rigidly tested by us to make sure that it meets our exacting requirements.

"HERCULES" (Red-Strand) Wire Rope is made in both Round Strand and Patent Flattened Strand constructions. It is important to use the type of wire rope that will fit the conditions under which it is to work. If you will tell us the kind of equipment you have, we shall be glad to suggest the right rope for best results.

Made Only by A. LESCHEN & SONS ROPE CO. Established 1857

5909 Kennerly Avenue
ST. LOUIS

New York **Chicago** **Denver** **San Francisco**

EASTERN TOOL & MFG. CO.
BLOOMFIELD NEW JERSEY

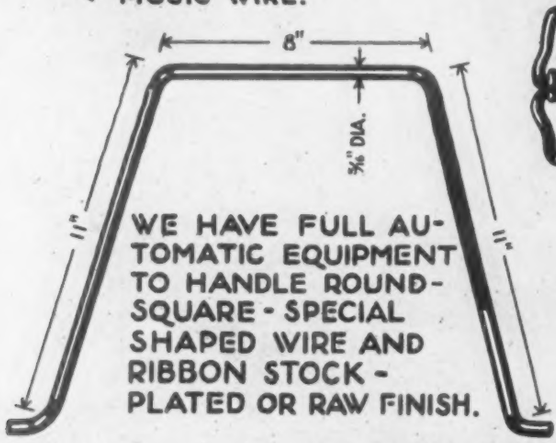
WIRE GOODS

FULL SIZE RING

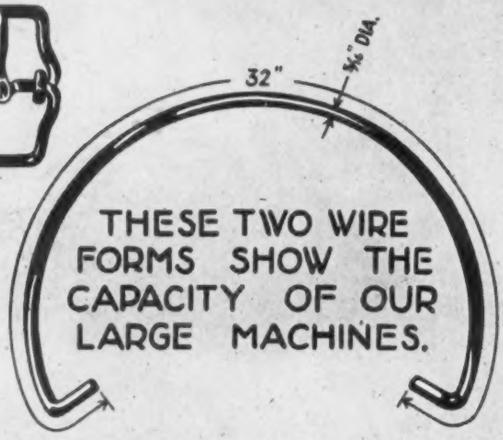
FULL SIZE SPRING MADE FROM .015 MUSIC WIRE.

A WIRE TONGUE BUCKLE WITH SMOOTH EDGES STRONGER THAN A STAMPED BUCKLE

ET&MFG CO



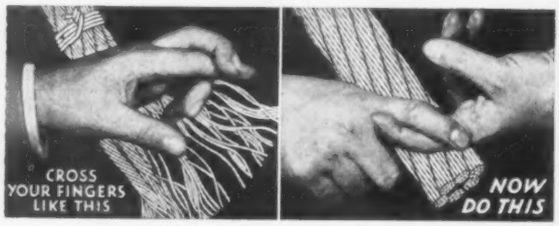




WE HAVE FULL AUTOMATIC EQUIPMENT TO HANDLE ROUND-SQUARE-SPECIAL SHAPED WIRE AND RIBBON STOCK - PLATED OR RAW FINISH.

THESE TWO WIRE FORMS SHOW THE CAPACITY OF OUR LARGE MACHINES.

WHAT ARE YOUR REQUIREMENTS?



PREFORMING ELIMINATES INTERNAL STRESS

Note the pressure between your fingers when you cross them—then note how they fly apart when you uncross them. This illustrates internal stress in ordinary wire rope.

In Tru-lay Preformed Wire Rope wires and strands are helically shaped—they lie naturally in position—there is no internal stress. This is why Tru-lay delivers from 30 per cent to 300 per cent increased service depending on the nature of the service and the character of the equipment.

Let us give you the facts. Address

AMERICAN CABLE COMPANY, *Inc.*

New York Central Bldg., 230 Park Ave., New York, N. Y.

District Offices: Chicago, Detroit, Philadelphia, Pittsburgh, Tulsa, San Francisco

ACCO

PREFORMED WIRE ROPE TRU-LAY

An Associate Company of the American Chain Company, *Inc.*

AMERICAN CABLE COMPANY
WIRE LINES
TRU-LAY *Preformed* and CRESCENT *Standard*

Buffalo WIRE
"A BETTER WIRE CLOTH"
For all industrial purposes. Prices and information on request.
BUFFALO WIRE WORKS CO., INC.
456 Terrace (Formerly Scheeler's Sons) Buffalo, N. Y.

COILED AND FLAT SPRINGS AND WIRE FORMS OF ALL KINDS
The CLEVELAND WIRE SPRING COMPANY
CLEVELAND, O.

QUALITY RAYMOND MFG. CO. SPRINGS
CORRY, PA.

LEE-BUILT SPRINGS

All sizes, all types,
any material, any quantity,
prompt deliveries
fair prices

Send specifications for quotations

LEE SPRING COMPANY, INC.
30 MAIN ST. BROOKLYN, N.Y.

HUNTER SPRINGS- *Any Type Any Metal*
HUNTER PRESSED STEEL CO.
Lansdale, Pa.

THE CHAS. FISCHER SPRING COMPANY
Round and Flat Springs, Wire Forms, Flexible Shafts and Tubing, complete Mechanical Assemblies
242 KENT AVE. BROOKLYN, N.Y.

CUYAHOGA
SPRINGS and WIRE SHAPES
THE CUYAHOGA SPRING CO.
10250 BEREA ROAD CLEVELAND, OHIO
CHICAGO DETROIT BUFFALO

There is no more
profitable way for a man to invest his time than to read the journal of his chosen field.

QUICK SERVICE in *Dependable SPRINGS*
COILED
FLAT
WIRE FORMS

American Spring & Mfg. Corp.
Holly Michigan

LIGHT *and* HEAVY

SPRINGS

Quality *Service*

EAGLE BRAND METAL PRODUCTS

MILLER & VAN WINKLE, Inc.

18 BRIDGE ST., BROOKLYN, N. Y.

M. D. HUBBARD SPRING CO.

SOUTH SAGINAW AND JESSIE STREETS

PONTIAC, MICH.

ESTABLISHED 1905

COILED and FLAT SPRINGS
(Phosphor Bronze Springs a Specialty)
WELCH EXPANSION PLUGS
(For Closing Core Holes)
SPECIAL WIRE SHAPES SMALL STAMPINGS
WASHERS and SPRING COTTERS
Send blue prints or samples for estimates.
(CATALOG MAILED UPON REQUEST)



WELCH EXPANSION PLUG

CHAMPION 401 STEEL RIVET FORGE

Made with adjustable Ball Bearings only.

Capacity 4" round iron in 10 minutes.

Hearth, 18 inches in diameter.

Fan Case, 9 inches in diameter.

Turns Easy Lasts Longer



Over a Million in Use

Write for No. 55 Catalogue on Blowers, Forges, Drills, Lathes, Grinders, Hack Saw Machines, Taps and Dies, Power Hammers, Ventilating Fans and Woodworking Machinery, etc.

CHAMPION BLOWER AND FORGE CO.—LANCASTER, PA.

THE
ANTHONY NEBULYTE OIL BURNING SYSTEM

A highly developed system of gas firing with oil fuel, 70,000 applications. Other systems quickly converted. Old burners easily replaced with NEBULYTE Oil and Gas burners. Installations everywhere.

THE ANTHONY CO. LONG ISLAND CITY, N. Y.

Hauck Venturi High Pressure Oil Burner
with and without Air Control Registers

Burn all light and heavy fuel oils with compressed air or steam at 30-lbs. or more as the atomizing agent. The fine oil atomization of these burners is responsible for the uniform and intimate mixing of oil and air resulting in high oil burning efficiency. Write us about your oil burning problems. We have and will recommend a burner to meet your requirements.

Hauck Mfg. Co., 128 - 10th Street, Brooklyn, N. Y.

OPERATE PICKLING BATHS PROFITABLY

RODINE

Saves Acid, Metal and Time

RODINE assures perfect pickling results, conserves metal; saves acid and time. Appreciably lowers costs. If your pickle tanks run profitably now, make them more so with RODINE.

Send for Bulletin No. 15

American Chemical Paint Co.
Ambler, Pa.
General Offices and Factory

PROTECT
Your Sheets & Strips with
PARALAN

. . . for SHEET and STRIP STEEL



Paralan Coated

------the Scientific Protective Coating

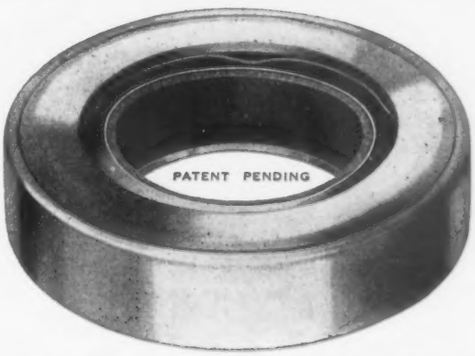
Protects from Rust—yet easily removed.

Saves thousands of dollars yearly in reducing cleaning costs.

Specify PARALAN on your next order of sheet or strip steel.

AMERICAN LANOLIN CORP.
LAWRENCE MASS.
BRANCH OFFICE: 10816 CLIFTON BLVD. CLEVELAND, OHIO

A Better Oil Seal
For All Applications



Gits Precision Oil Seal

will retain lubricant of all kinds and will exclude moisture, dirt, and foreign matter from your bearings.

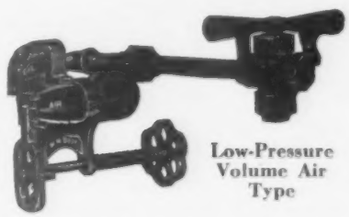
GITS PRECISION OIL SEALS operate with minimum friction.

CATALOG ON REQUEST

ENGINEERING SERVICE WITHOUT OBLIGATION

GITS BROS. MFG. CO.
1846-62 S. Kilbourn Avenue. - - Chicago, Ill.

This oil burner does not clog or carbonize



Low-Pressure Volume Air Type

This W. N. Best Low-Pressure Burner is positively fool-proof. There are no parts to get out of order or break—it cannot clog—and the flame can be adjusted to fit any type of furnace or fire box.

Its economy of fuel will surprise you, as it has others. Give a W. N. Best Burner a test beside an internal mixing or needle point burner and note the difference.

Our Engineering Service Department will be glad to assist you on all industrial heating problems.

W. N. BEST Corporation
295 Fifth Ave. New York, N. Y.

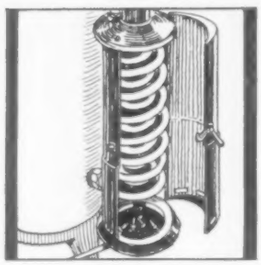
THERE'S AN OAKITE SERVICE MAN NEAR EVERY INDUSTRIAL PLANT

Use this NATION-WIDE OAKITE cleaning service!



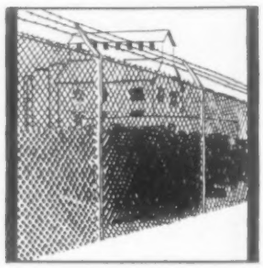
ILLINOIS

AN Illinois manufacturer of office equipment cleaned steel stamped parts by hand with naphtha. Slow and dangerous, yes, but other methods previously tried up to then proved unsuccessful in completely removing a tenacious stamping oil from surfaces before japanning. Finally an Oakite Service Man stopped in one day. Now they no longer worry about fire or explosion. An Oakite material cleans the steel thoroughly, without hand-scrubbing. Rejects are a thing of the past. Time and money are saved.



CALIFORNIA

In California, a maker of hot water heaters had a troublesome problem removing rust-preventative from iron pipe. A solvent and a lot of hard hand-scrubbing did a fair job. The near-by Oakite Service Man suggested an Oakite material. Now a five-minute boil in an Oakite solution cleans perfectly, saves time and money.



NEW JERSEY

Another example . . . . a New Jersey manufacturer of woven steel wire formerly found it necessary to use a combination of two materials to clean wire before pickling previous to galvanizing. By changing to an Oakite product, they now do their cleaning with one material and, in addition, save money on upkeep costs of tank because quantities needed are smaller. Microscopic examination of wire shows it perfectly clean and with excellent color.

This Advertisement is one of a series based on actual occurrences n. n.

Let the Oakite Service Man near you devote himself to your cleaning problems! Let him help you to lower costs and improve results in cleaning, and in related operations, such as cutting, grinding, rust-proofing, and paint stripping. Ask us to have him call, or send for booklets on "Modern Metal Cleaning" and "Modern Cutting and Grinding."

OAKITE PRODUCTS, INC., 20 Thames St., New York, N. Y.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

THERE'S AN OAKITE MATERIAL FOR EVERY KIND OF CLEANING



. . . ideal for factory buffing of STAINLESS STEEL PRODUCTS

Products made of Stainless Steel:

Automobile lamps, radiator shells, bumper plates, hub caps, gas tanks, cowl strips, window mouldings, running board mouldings, tire covers, windshield frames and brackets, instrument boards, horns, etc. . . . airplane parts . . . restaurant equipment . . . railings . . . kitchenware . . . lighting fixtures . . . razors . . . electric irons . . . household hardware . . . cutlery . . . grills . . . doors and door frames . . . refrigerator hardware . . . cigar lighters . . . ash trays . . . window sash and frames . . . building entrances and domes, etc.

◆

Next to the actual delivery, the final step in the completion of a stainless steel contract is the satisfactory finishing or buffing of the product . . . and for this purpose manufacturers everywhere are using McAleer's Stainless Steel Buffing Compositions.

First to develop an efficient, quick and economical means of giving a *permanent* finish to stainless steel and rustless iron, McAleer established the "standard of quality" and immediately became the country's leading source of supply.

McAleer's Stainless Steel Buffing Compositions are available in three grades: No. 6, medium dry, for small parts; No. 7, medium greasy, for flat parts; and No. 7-F-190, for miscellaneous work. In requesting samples, please specify which compositions are desired.

MCALEER
MANUFACTURING COMPANY

Lyndon and Prairie Avenues, Detroit, Mich.

ACCURACY *with* LONG RUNS



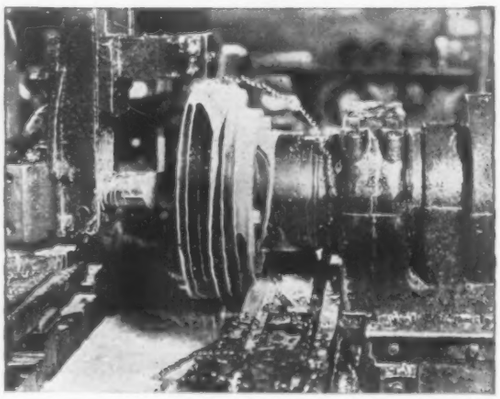
Courtesy of Bates-Wohlerts Company, Lansing, Mich.

OPERATION: HOBBING 15 IN. STARTER GEAR.
MACHINE: GOULD & EBERHARDT
MATERIAL: 50 CARBON STEEL
CUTTER SPEED: 95 R.P.M.
LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER.

The development of machine tools which will stand up under heavy cuts at high speeds has stimulated the small tool manufacturers to produce tools with which these speeds and cuts can be taken. The efficiency of both machines and tools is lessened through excessive tool regrinds. Dull tools and frequent "set ups" produce work lacking in accuracy and finish.

Sunoco is well worth the careful consideration of any production executive faced with the responsibility of obtaining increased production at low cost per unit.

Sunoco paves the way toward higher machine tool efficiency through increased machine speed, longer life per tool grind, reduced tool maintenance, less lost time for cutting tool changes, and helps to maintain closer tolerances and better finish throughout a long run.



Courtesy of Bates-Wohlerts Company, Lansing, Mich.

OPERATION: TURNING 15 IN. GEAR BLANK.
MACHINE: POTTER & JOHNSON AUTOMATIC LATHE.
MATERIAL: .50 CARBON.
FEED: .05 IN.
SPEED: 130 S.F.P.M.
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER.

SUN OIL COMPANY, Philadelphia, U.S.A.

SUN
EMULSIFYING
Made by SUN OIL CO. *producers*

Akron, Albany, Allentown, Atlantic City, Baltimore, Battle Creek, Beaulumbus, Dallas, Dayton, Detroit, Flint, Grand Rapids, Harrisburg, Jackson, Philadelphia, Pittsburgh, Providence, Quebec, Quincy, Reading, Rochester,

MAINTAINED *between* TOOL GRINDS

Sunoco will protect the finished work from rust and corrosion, is perfect in its emulsion; will not separate. It is hygienic and will not become rancid after prolonged use.

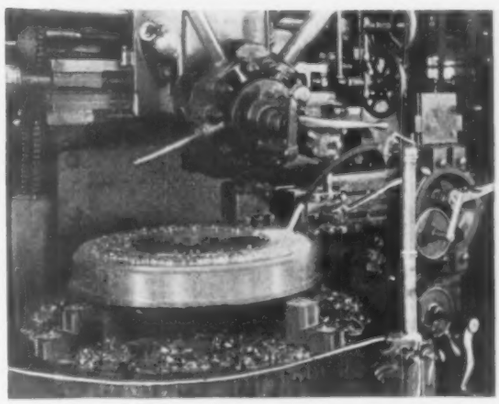
These are the reasons why leaders in the metal cutting industry recognize the value of Sunoco in producing better work at increased output per machine unit.

The Sun Oil Company offers assistance in solving individual metal cutting problems through the services of Cutting Oil Engineers who have had wide experience in the study of cutting oils and their application.

Write any of our many branches, or to our home office.

The Sun Oil Company produces a type of cutting oil to meet every metal cutting requirement.

Courtesy of Philadelphia Gear Works, Philadelphia, Pa.



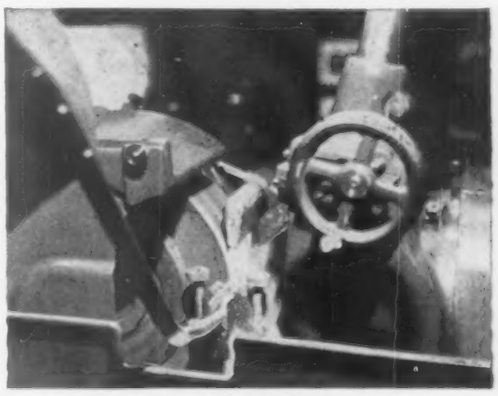
OPERATION: TURNING AND FACING BEVEL GEAR BLANK.
MACHINE: BULLARD VERTICAL TURRET LATHE.
MATERIAL: DUPLEX GEAR STEEL NO. 1
CUT: $\frac{5}{8}$ IN. FACING—$\frac{7}{8}$ IN. TURNING, O. D.
FEED: $\frac{1}{32}$ IN.
SPEED: 42 S.F.P.M.
LUBRICANT: 1 PART SUNOCO TO 10 PARTS WATER.

SUN OIL COMPANY, Ltd., Montreal, Canada.

OCO
CUTTING OIL
of BLUE SUNOCO MOTOR FUEL

mont, Binghamton, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Co- (Mich.), Jacksonville, Miami, Montreal, Newark, New York, Ottawa, Scranton, Syracuse, Tampa, Toledo, Toronto, Trenton, Tulsa, Wilmington.

Courtesy of Cincinnati Grinders, Inc., Cincinnati, Ohio



PART NAME: PISTON PIN.
MACHINE: CINCINNATI CENTERLESS GRINDER.
MATERIAL: HARDENED STEEL.
LIMITS:
ROUND WITHIN . . . . . .00005 IN.
STRAIGHT . . . . . .00005 IN.
SIZE . . . . . .0001 IN.
STOCK REMOVED: .001 IN.
PRODUCTION RATE: 28 PER MINUTE.
LUBRICANT: 1 PART SUNOCO TO 40 PARTS WATER.

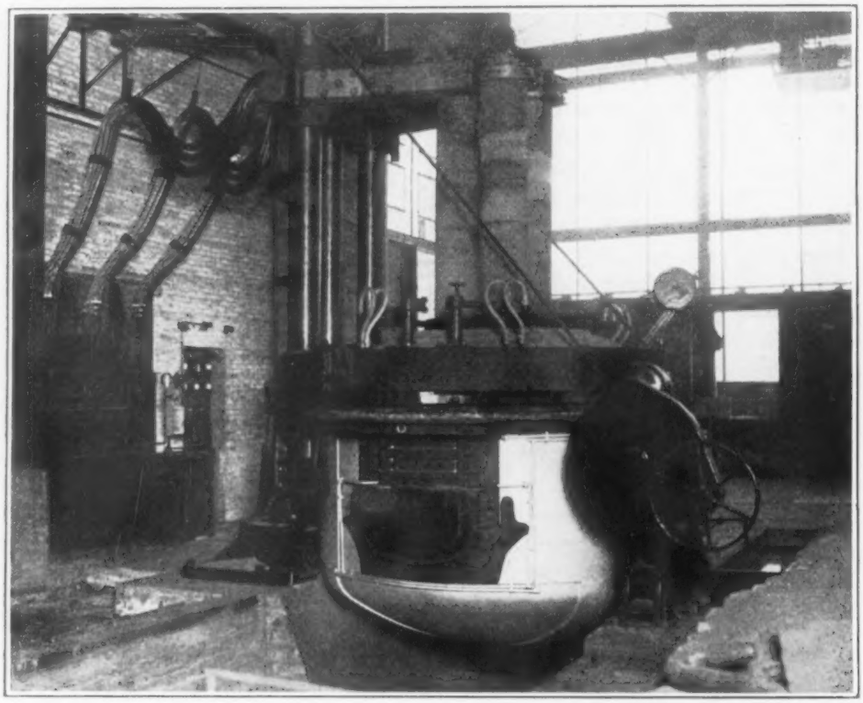
MOORE RAPID 'Lectromelt FURNACES

(TRADE MARK)

(W. E. MOORE PATENTS)

THE MOST RAPID AND ECONOMIC ELECTRIC FURNACES ON THE MARKET FOR THE PRODUCTION OF GRAY AND MALLEABLE IRONS, ALLOY AND CARBON STEELS

ASK 'LECTROMELT USERS



RECENT 6 TON PER HOUR 'LECTROMELT FURNACE INSTALLATION

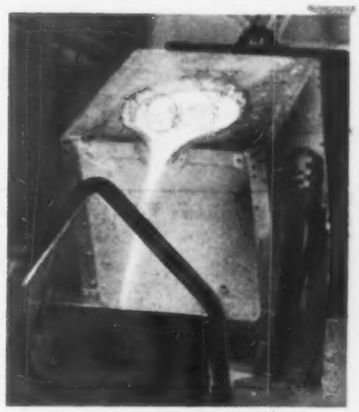
Above is shown 'LECTROMELT furnace equipped with standard top charge rig for hydraulically raising the furnace roof and superstructure and swinging same to one side for rapid and convenient charging with drop bottom bucket. Notice roof slightly raised previously to being swung back.

STANDARD SIZES 50 POUNDS TO 50 TONS

Pittsburgh Electric Furnace Corporation
Pittsburgh, Penna.

AJAX NORTHRUP

CORELESS INDUCTION FURNACES

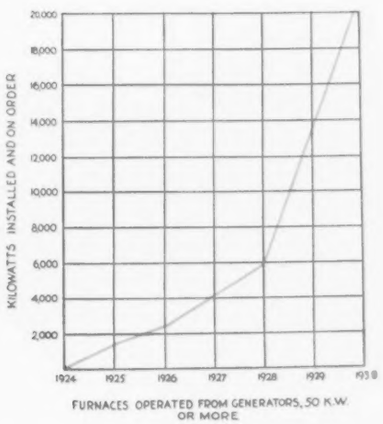


2200 Lb. Furnace Being Poured

AJAX-NORTHRUP FURNACES OPERATED BY MOTOR-GENERATORS OF 50 KW. CAPACITY AND OVER

Motor-Generator Rating	United States and Canada	England	France and Switzerland	Germany and Austria	Sweden and Denmark	Japan
1,250 kw. [a]	1					
1,125 kw. [b]	1					
600 kw. [c]	4					
400 kw. [d]	1		2			
300 kw. [e]	8		2	1		
200 kw. [f]	1		1	1		
150 kw. [g]	9	1		2	1	
100 kw.–50 kw. [h]	12	7	4	1		
		4	2	5	4	1
Total kw.	10,015	1,650	3,100	3,150	900	250

[a] 3,000 pound furnace.
[b] 7,800 pound furnace.
[c] 4,500–2,000–1,000 pound furnaces.
[d] 2,000–600 pound furnaces.
[e] 2,000–1,000–600 pound furnaces.
[f] 1,000–600 pound furnaces.
[g] 1,000–600–300 pound furnaces.
[h] 600–300–100 pound furnaces.



FURNACES OPERATED FROM GENERATORS, 50 K.W. OR MORE

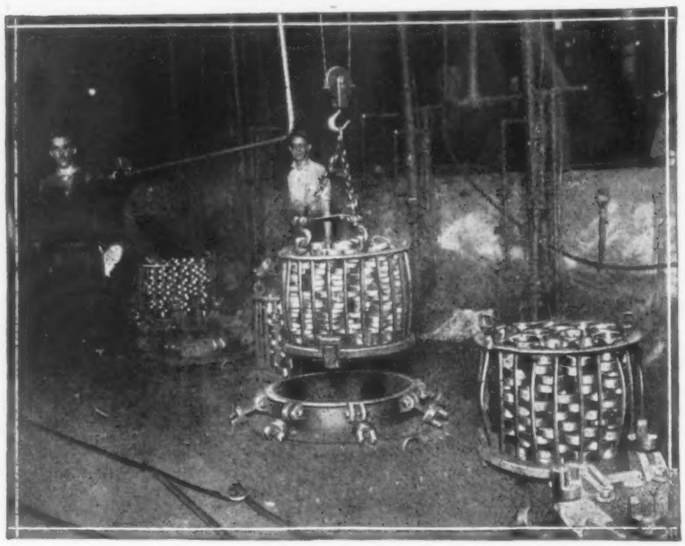
Write for information

Ajax Electrothermic Corporation
Trenton, New Jersey

G. H. CLAMER, President

E. F. NORTHRUP, Vice Pres. and Tech. Adviser

Is Your Heat Treating Equipmen



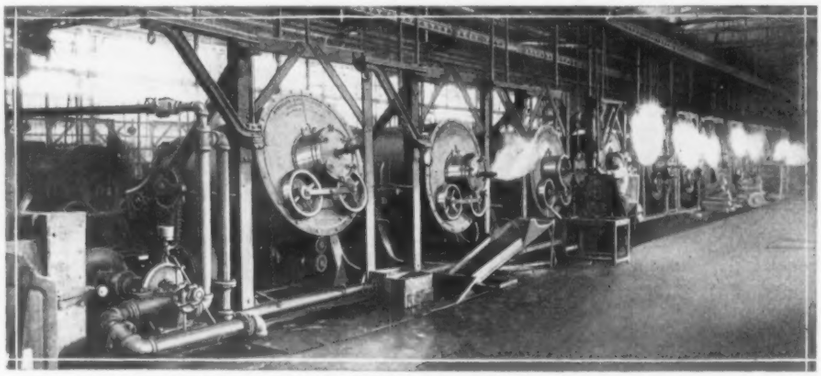
Gears of all kinds, large races, etc., are carburized in vertical retort furnaces because of the uniformity of results secured, reduction in floor space, labor for handling, elimination of packing cost, and the over-all reduction in cost thereby made possible.

With the keen competition we all have today, you cannot afford to use equipment that is 10 years old or more, that should have been scrapped long ago.

Though purchased only recently, a furnace may be obsolete today if a new design of Heating Machine will result in labor saving, fuel saving or time saving, though operated only possibly one or two days a week.

Old equipment is expensive to operate and to maintain in operating condition. Have you now in your plant equipment which should be replaced because of obsolescence?

"American" engineers have pioneered for more than half a century in the develop-



Balls, rollers and races for anti-friction bearings, chain and chain parts and all manner of small and medium sized machine parts are today generally being carburized in rotary furnaces because of their convenience and the low cost possible only with this class of equipment.

AMERICAN GAS FURNACE CO. — PIONEERS IN 1878 — LEADERS TO-DAY

America's Pioneers in

American Gas Furnace

Automatic Heat Controllers
Automatic Quenching Tanks
Blowpipes or Blowtorches, Hand and Stand
Blowers
Boosters, Gas
Brass Melters
Brazing Furnaces and Tables
Burners
Burners for Electric Lamp Bulb Manufacture
Carburizing Machines
Cyanide Furnaces
Cylindrical Furnaces
Forges
Forges, Glass Bending

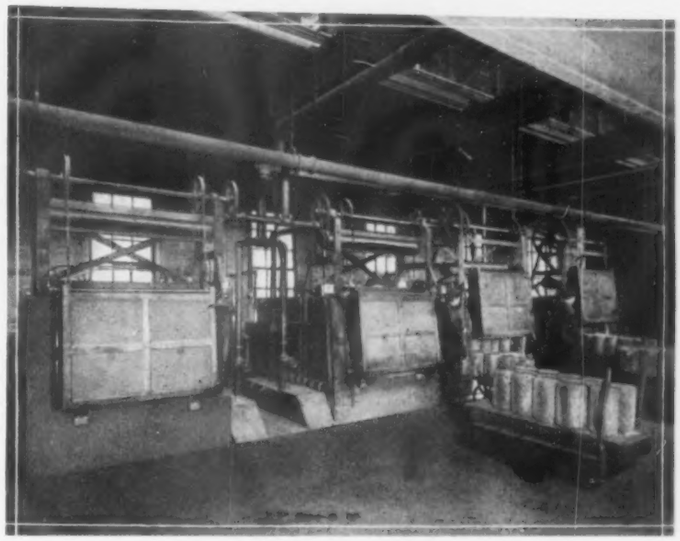
Obsolete, or Up-to-Date??

ment of industrial heating appliances because old methods were too expensive.

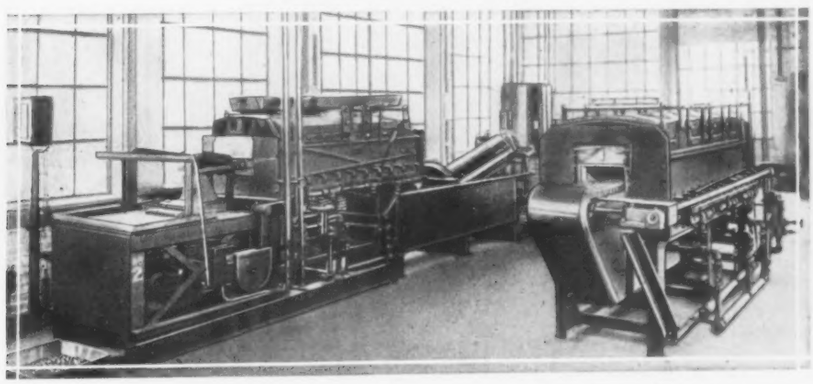
"American" engineers were responsible for the first air blast melter, the first rotary retort machine, the first pusher type machine, the first roller hearth furnace, the first "Carbonia" or gun-metal finish equipment, the originators of the gas carburizing process and equipment for its application, and, similarly, the originators of the nitrogenizing process and equipment for its use.

"American" engineers still lead the way. Leading manufacturers of ball and roller bearings, sewing machines, typewriters, calculating machines, automotive parts, etc., attest this.

"American" engineers are at your service.



Oven furnaces of advanced design give uniform heating at every point in the heating chamber. Special door construction permits utilizing the entire available heating space. Various users are well pleased with these furnaces.



The reciprocating hearth machine pictured is used for hardening an endless variety of small parts such as pins, needles, springs, ball races, etc. Made in various sizes.

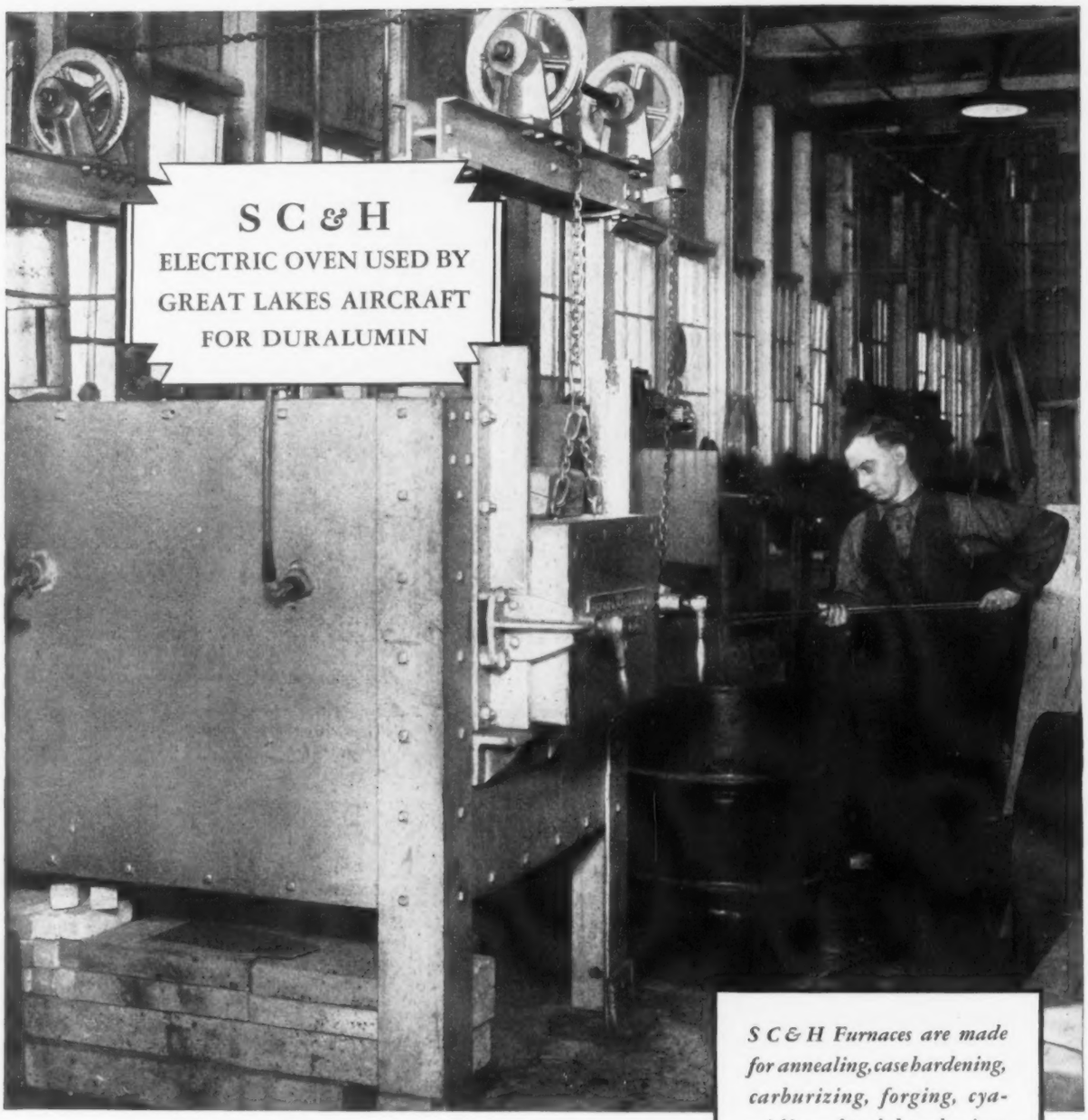
in Industrial Heating

Company, Elizabeth, N. J.

Heating Machines
Melting Furnaces
Muffle Furnaces
Oil-Tempering Furnaces
Oven Furnaces
Rivet Heaters
Soft Metal and Lead Hardening Furnaces

Textile Appliances for Singeing, Calendering, Tentering and Drying
Tube-Heating Furnaces
Every Type of Gas Blast Burner, Furnace and Heating Machines for Industrial Use

AMERICAN GAS FURNACE CO.
53 YEARS of INDUSTRIAL HEATING ACHIEVEMENT
ELIZABETH, N.J.



DURALUMIN rivets for use in fabrication of duralumin structural parts of military and commercial airplanes built by the Great Lakes Aircraft Corporation are heat treated in this SC&H electric oven-type furnace.

Due to the peculiar ability of duralumin to "age" rapidly—duralumin parts heated to 940° to 950° Fahr. attaining a Rockwell hardness of 90° 24 hours after removal from the heat—the rivets are heat treated in small baskets and delivered fresh from the furnace quench to workmen every 20 minutes to avoid "aging" before they can be worked.

Strong, Carlisle & Hammond Engineers design, build and install electric, oil and gas-fired furnaces for every industrial use. They are prepared to plan and completely equip a modern heat treating department based on your production requirements. Call on them when your heat treating facilities are to be considered and the problem seems difficult. The Strong, Carlisle & Hammond Company, 1382 W. Third St., Cleveland, Ohio.

S C & H Furnaces are made for annealing, case hardening, carburizing, forging, cyaniding, lead hardening, nitriding and oil tempering. They are built in all sizes of Oven, Pot, Continuous, and Special Types for Electric, Oil or Gas application.

DISTRICT OFFICES:

136 FEDERAL STREET - - - BOSTON, MASS.
1300 FORT STREET, W. - - DETROIT, MICH.
11 S. DESPLAINES STREET - - CHICAGO, ILL.
335 FIFTH AVE. - - - PITTSBURGH, PA.
30 CHURCH STREET - - - NEW YORK, N.Y.

STRONG, CARLISLE & HAMMOND

MANUFACTURERS OF ELECTRIC, OIL AND GAS INDUSTRIAL FURNACES

44% REDUCTION *in*

Compensation Insurance Cost

with the Hyro Automatic Furnace



UNDERWRITERS of insurance have quickly taken notice of the Hyro Automatic case-hardening and tempering furnace. They have found that dangers to life and limb, usually associated with the liquid-bath treatment of metal, are so completely eliminated in the Hyro Automatic that compensation premiums can be cut almost in half. And in the case of fire insurance there is also a material reduction in the rates.

The reasons for this high factor of safety are: The combination of pot furnace and quenching tank into one unit; the hoods that completely enclose the unit, effectively sealing in flame, fumes and hot, splashing liquid; the fan that draws off the injurious gases; Pyrex windows that permit observation of the work without opening the hoods; automatic charging, quenching and discharging. Not only do all these features reduce insurance premiums; they also help to minimize labor turnover.

But even more important to manufacturers are the striking advances in case-hardening and tempering efficiency obtained with the Hyro Automatic: The pot furnace that operates on about half the usual gas consumption; the full or semi-automatic operation that cuts labor costs; the absolute control over uniformity in depth and degree of hardness; the adaptability to all kinds of work, basket, racked or strung, big or small. In other words, the Hyro Automatic turns out *better work, faster and at less cost.* It will be distinctly worth your while to find out all about it. The coupon is for your convenience. Make use of it—*now!*

1 Hood-enclosed pot furnace. Has Pyrex window for observation of work while in process. All fumes go up the flue.

2 Worm-gear driven hand-wheel, which turns with ease, automatically empties the basket into the quenching tank.

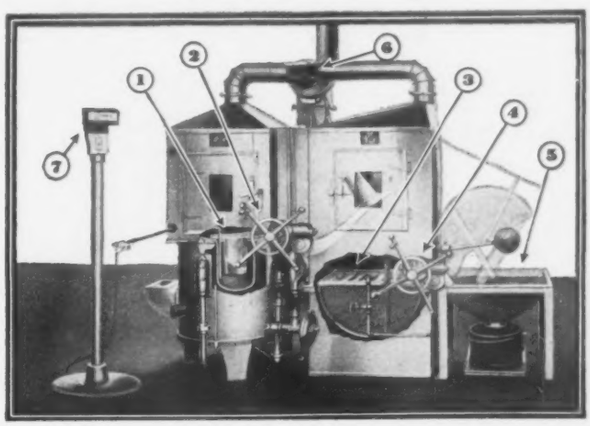
3 Quenching tank, fully enclosed. Covered by a baffle plate to "break up" work and prevent back-splash. Hood opens above into an exhaust pipe.

4 Hand-wheel which empties quenching tank basket into hopper. Counterbalanced and self-locking.

5 Hopper through which finished work is discharged into baskets or tote-boxes.

6 Exhaust system which draws off fumes from both hoods.

7 Portable pyrometer.



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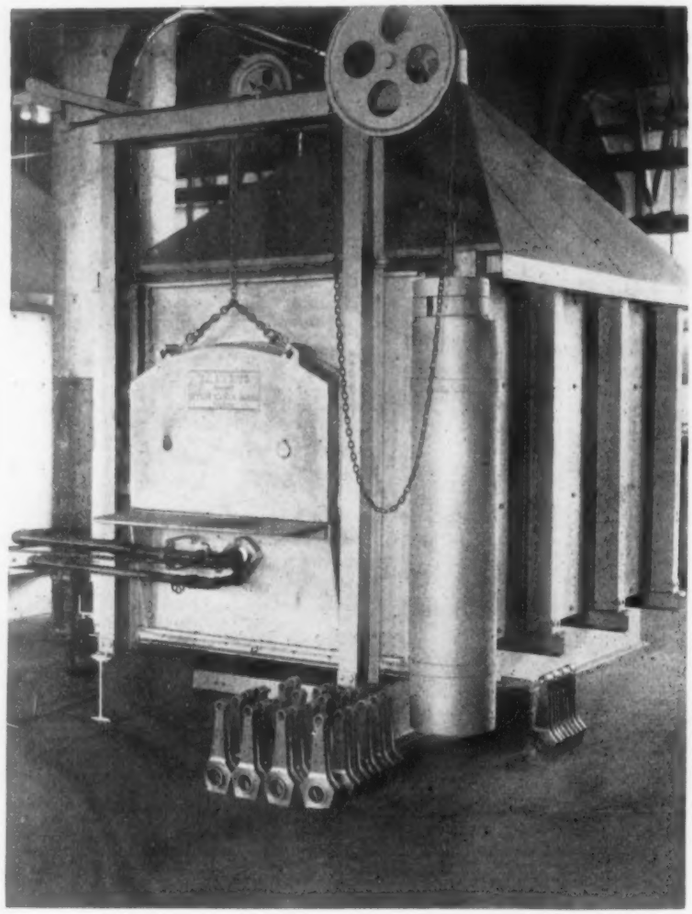
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For Case Hardening and Tempering

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FREE The new Stewart heat-treating wall chart is now ready. There is no charge—just your request on your company letterhead will bring it to you. You will run across thousands of this chart on the walls of heat-treating rooms throughout the country because it contains some mighty useful information.

Stewart Representatives

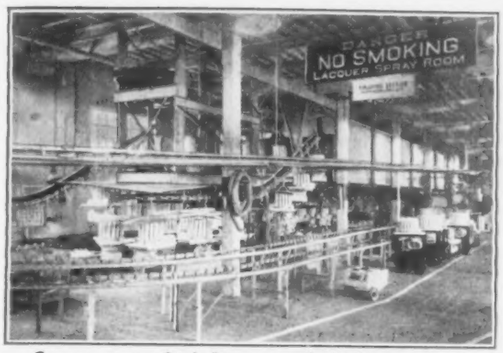
Every Stewart representative is a member of the American Heat Treating Society. Put your heat treating problem up to any of them. They will give you an honest, unbiased opinion without obligation. If no new equipment is necessary, they will tell you so honestly and if it is necessary, they'll tell you that too, just as honestly.

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Pfaff and Bathke, Pioneer Building, St. Paul, Minn.
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C. B. Backcock Co., 135 Bluxome St., San Francisco, Cal.
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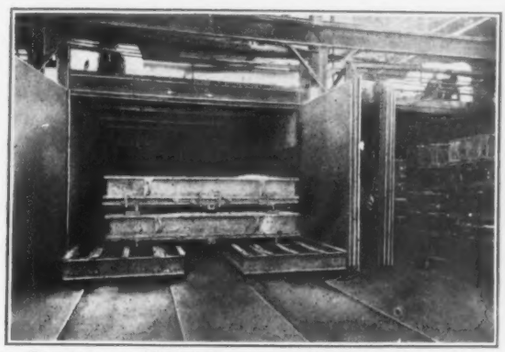
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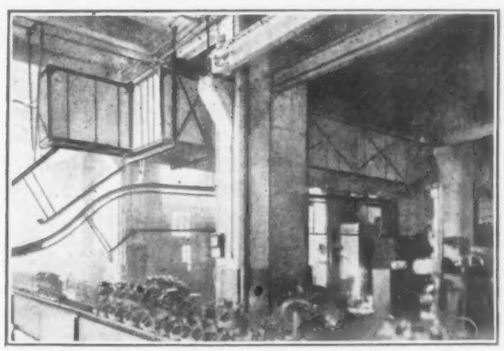
50 Gehnrich Ovens in One Large Plant



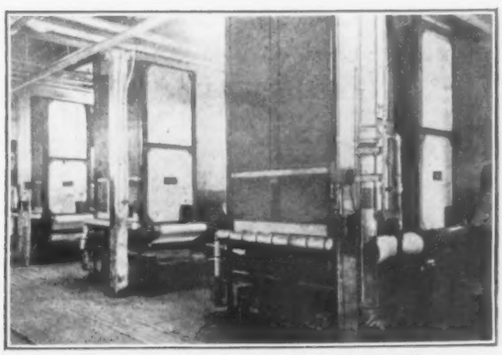
Conveyor oven for baking enameled refrigerator units



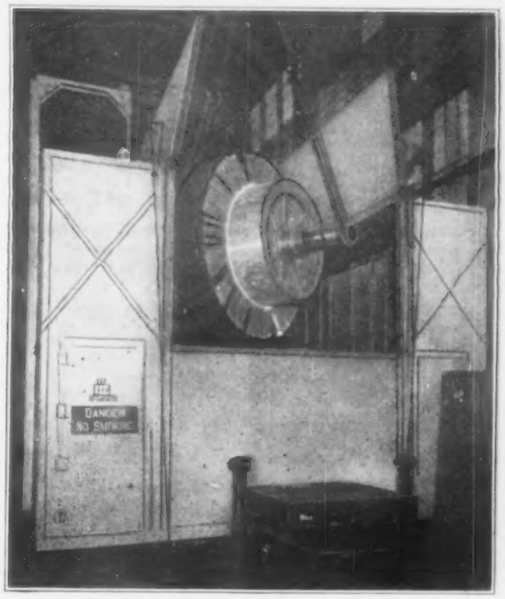
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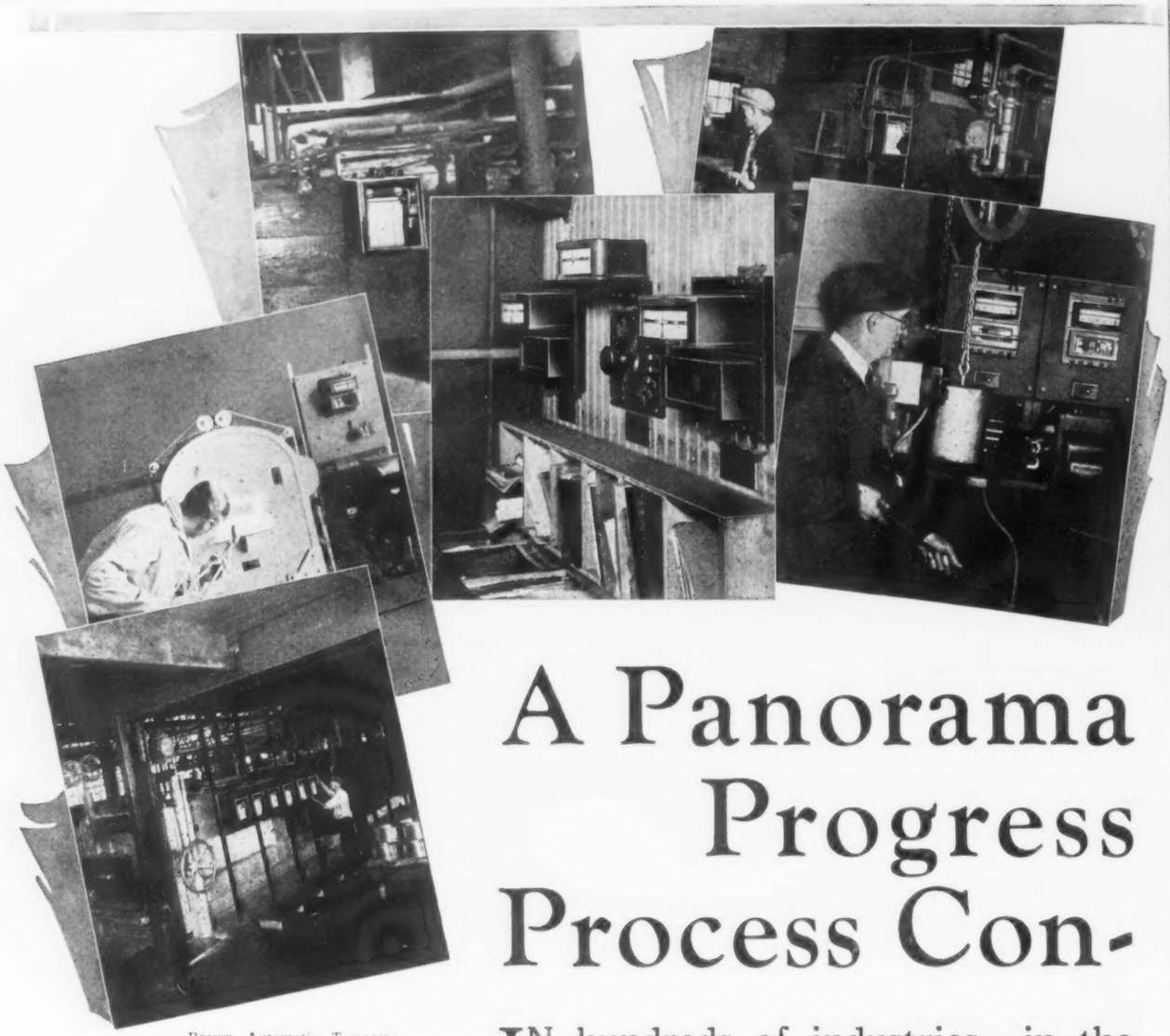
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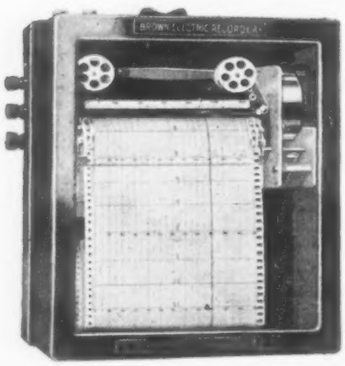
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Brown Automatic Temperature Controls in a variety of applications for heat treating brass, tool steel, sheets, forgings, iron castings and cutlery.

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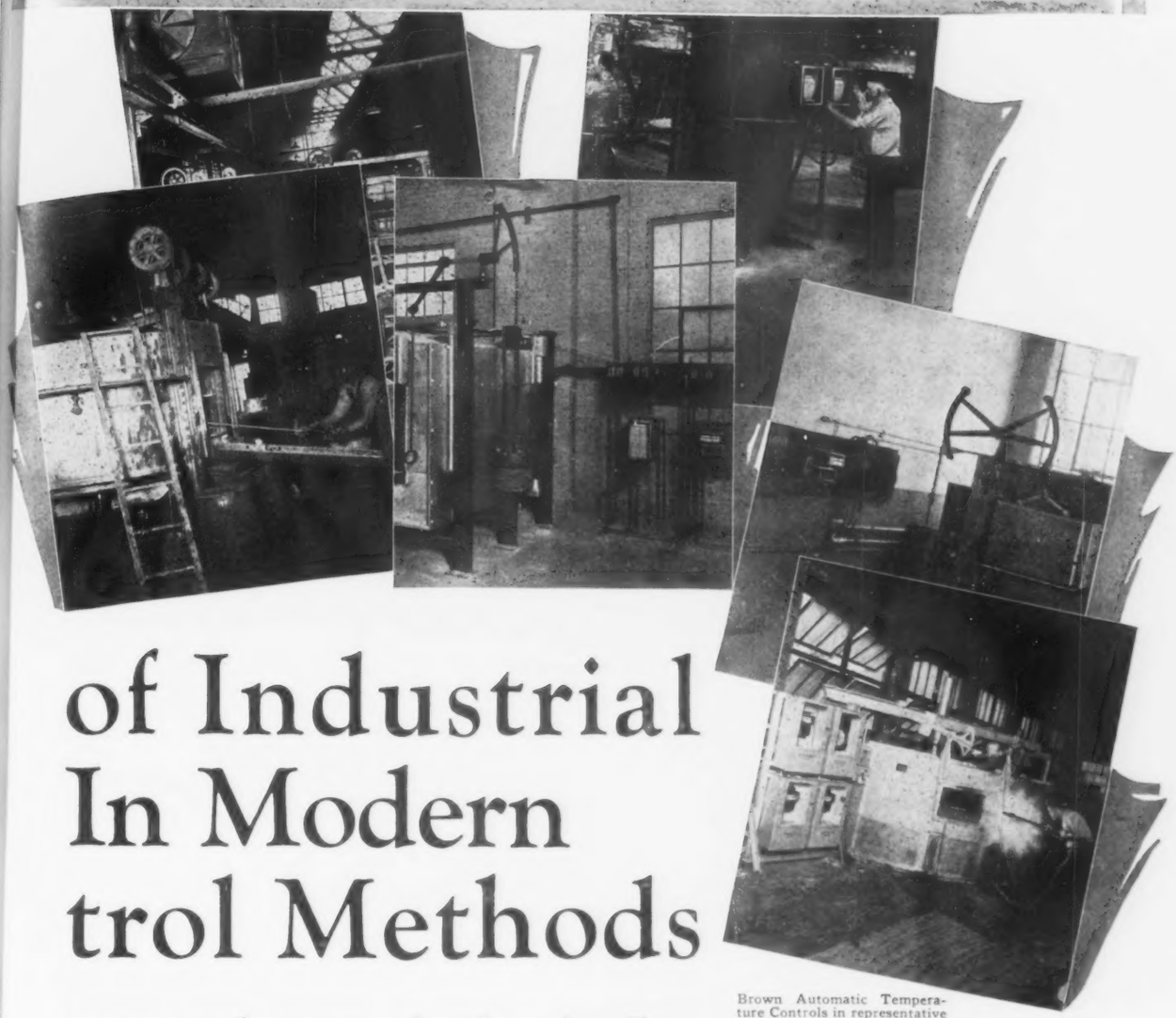
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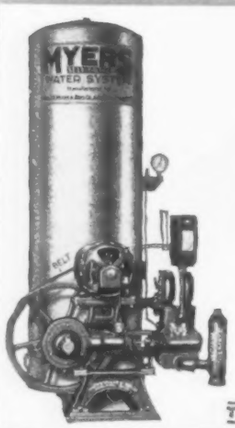
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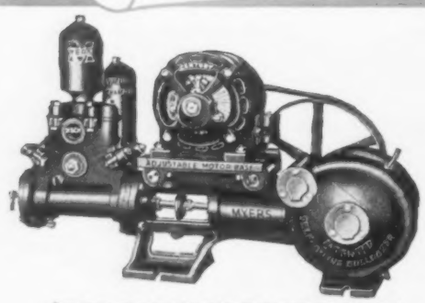
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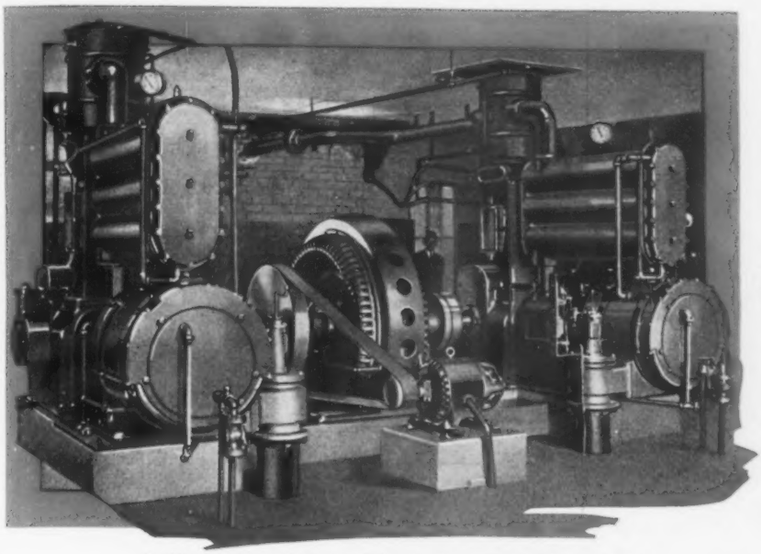






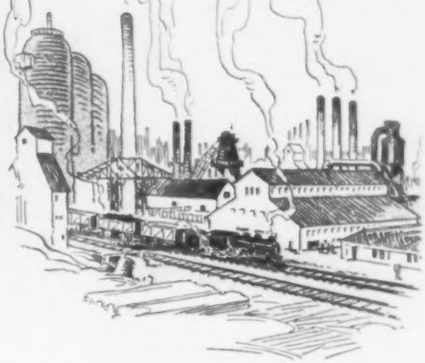
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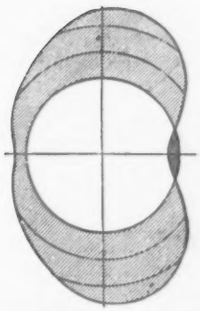


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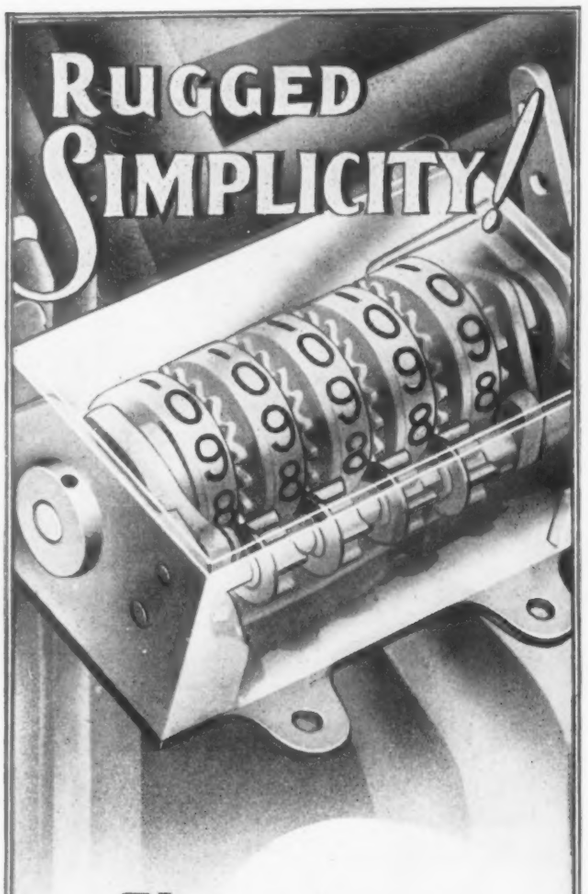
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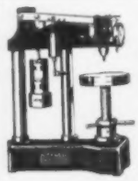
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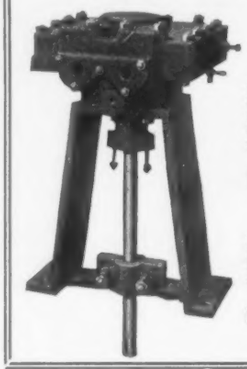


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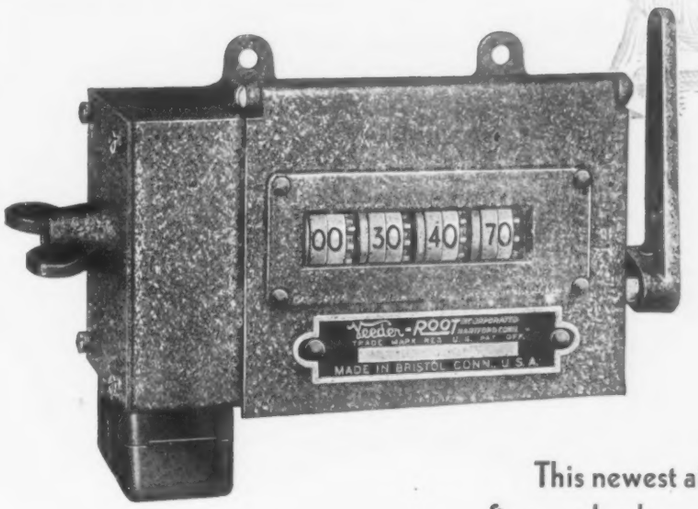
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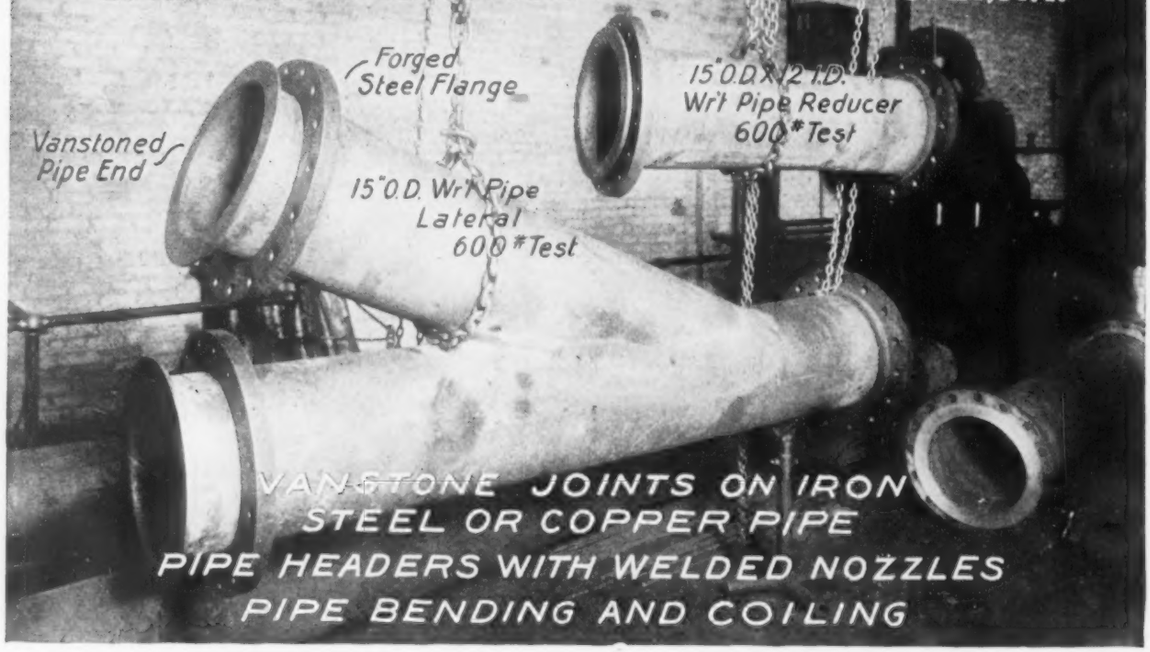
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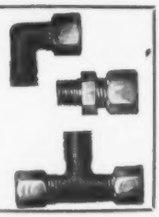
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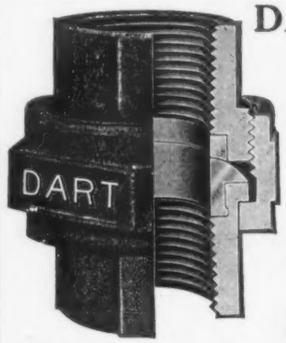
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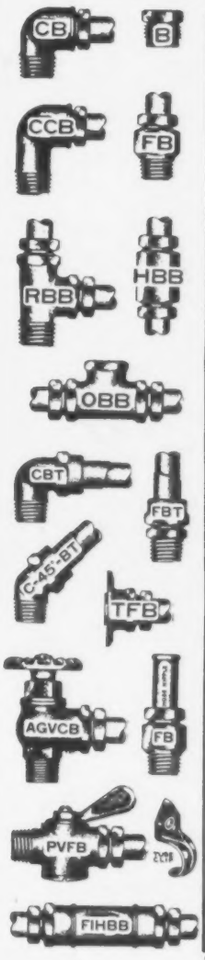
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1/32	.0312	.0008	17/32	.5312	.2217
3/64	.0468	.0016	35/64	.5468	.2349
1/16	.0625	.0031	9/16	.5625	.2485
5/64	.0781	.0048	37/64	.5781	.2624
3/32	.0937	.0069	19/32	.5937	.2769
7/64	.1093	.0093	39/64	.6093	.2916
1/8	.125	.0123	5/8	.625	.3068
9/64	.1406	.0154	41/64	.6406	.3223
5/32	.1562	.0192	21/32	.6562	.3382
11/64	.1718	.0231	43/64	.6718	.3545
3/16	.1875	.0276	11/16	.6875	.3712
13/64	.2031	.0323	45/64	.7031	.3883
7/32	.2187	.0376	23/32	.7187	.4057
15/64	.2343	.0431	47/64	.7343	.4235
1/4	.25	.0491	3/4	.75	.4418
17/64	.2656	.0553	49/64	.7656	.4604
9/32	.2812	.0621	25/32	.7812	.4794
19/64	.2968	.0691	51/64	.7968	.4987
5/16	.3125	.0767	13/16	.8125	.5185
21/64	.3281	.0845	53/64	.8281	.5386
11/32	.3437	.0928	27/32	.8437	.5591
23/64	.3593	.1013	55/64	.8593	.5800
3/8	.375	.1105	7/8	.875	.6013
25/64	.3906	.1198	57/64	.8906	.6229
13/32	.4062	.1296	29/32	.9062	.6450
27/64	.4218	.1398	59/64	.9218	.6675
7/16	.4375	.1503	15/16	.9375	.6903
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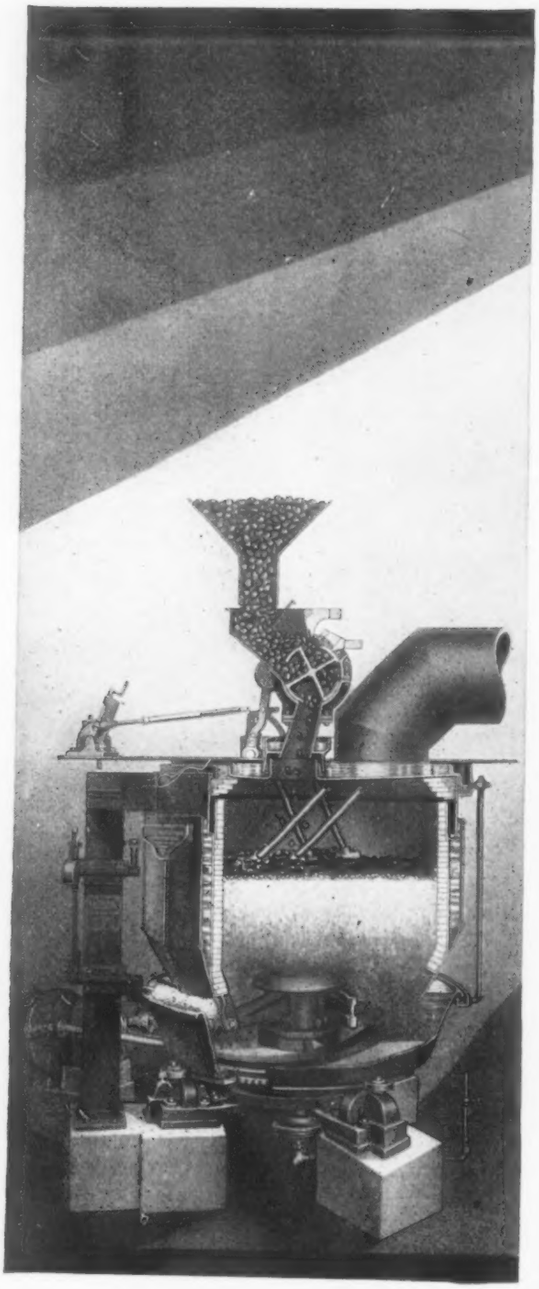
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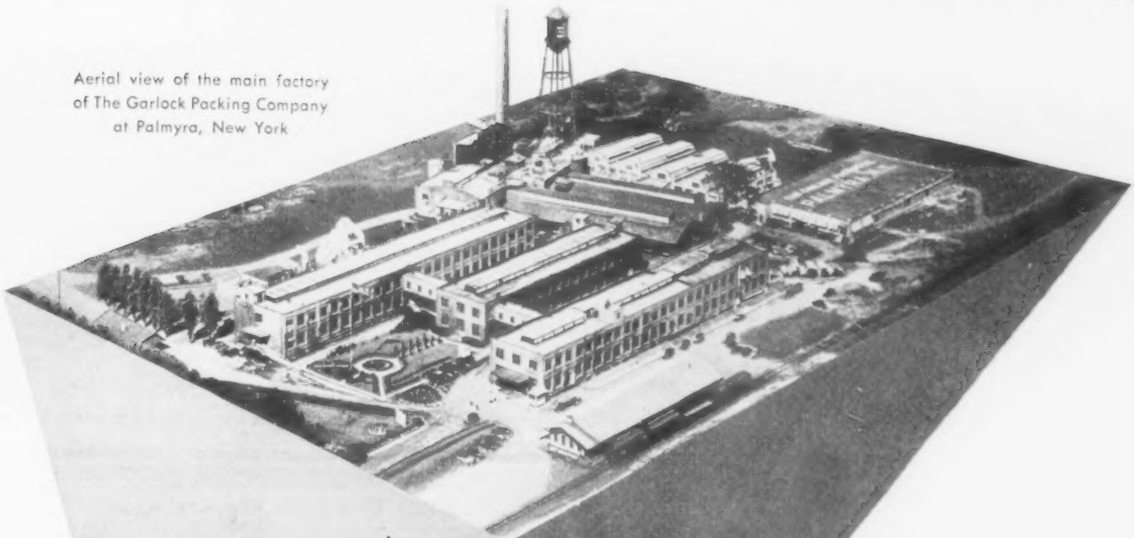
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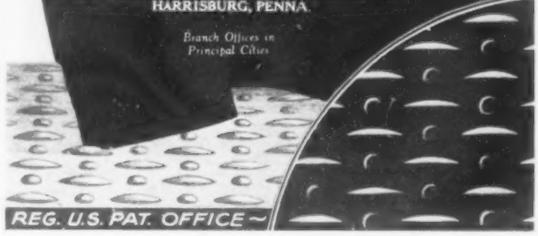
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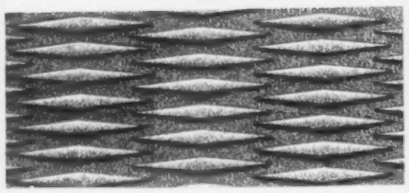


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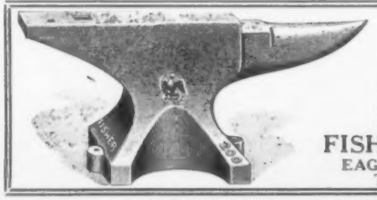
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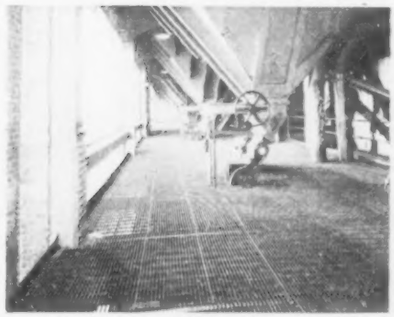
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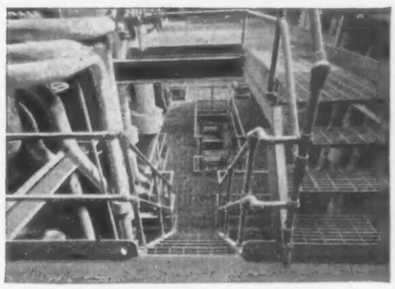
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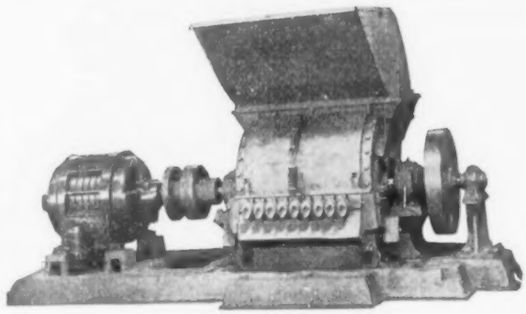
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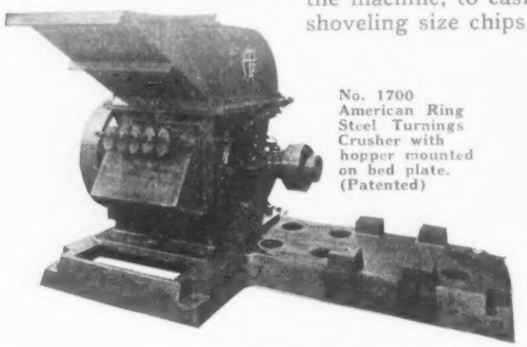
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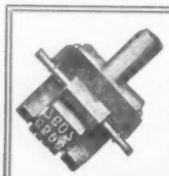
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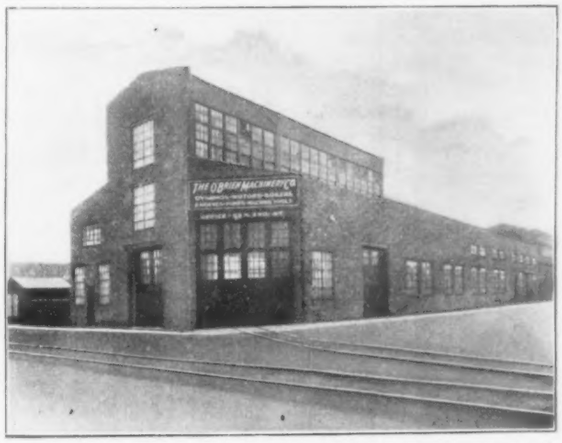
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30″x10′ American H.D. Lathe
2—No. 2 Davenport Automatic
No. 1 Shuster Wire Straightener
½″ Shuster Wire Straightener

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DOUBLE CRANK PRESSES

INSTALLED NEW 1928. IN OPERATION ABOUT ONE YEAR

CAN BE INSPECTED IN OPERATION

When you WANT these PRESSES they will not be AVAILABLE

AT PRESENT LOW PRICES—BUY NOW

Two (2) No. 8-84″ Bliss double and twin geared (tierod) 16″ stroke, 84″ between uprights, motor driven; motor driven ram adjustment. Marquette air cushions in bed total weight approximately 90,000 lb. each.

Two (2) No. 6-72″ Bliss geared (tierod) 8″ stroke; 72″ between uprights; motor driven. Ram spring counterbalanced. Total weight approximately 36,000 lb. each.

One (1) 5-72″ Bliss geared (tierod) 6″ stroke; 72″ between uprights; motor driven. Marquette air cushions in bed. Total weight approximately 20,500 lb.

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One (1) No. 8-72″ Niagara power squaring shear; capacity 3/16″ x 72″ long. Gap in housings 15″.

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Nos. 3½-B, 3½-C, 5-S.
Toledo: Nos. 168½.
DOUBLE CRANK
Toledo: Nos. 92-B, 96-E.
Toledo Nos. 59¾.
2¼″, 3″, 3½″, 4″ and 5″
Acme and Ajax Upsetters

42″ Gisholt Boring Mill; M.D.
51″ Niles Boring Mill; 2 heads.
12′ Betts Boring Mill; 2 swivel heads.
5″ bar D. & H. Floor Type Boring Mill.
D-3 Colburn H.D. Drill; 3″ cap.
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7′ Dreses Univ. Radial; Tap. Attach.
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No. 6-A, 72x20 Cincinnati Gear Cutter.
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Baltimore, Md.

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CINCINNATI 18″ Automatic Plain Miller
GENERAL MACHINERY CORPORATION
"The Machine Tool Merchants"
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72″ Niles Vert. Mill, 2 heads, all geared feeds.
National Bulldozer, 16″ stroke, crosshead 36″ long.
South Bend Lathe 16″xs′ Bradford 36″x14′.
B. & S. No. 4, Cinn. No. 1½ Univ. Millers.
6′ Bickford Radial Drill, S.P.D. gear box.
D. & H. Openside Planer, 42″x42″x10′.
Rockford No. 3 Inc. Presses No. 18 Bliss.
Niles 200 ton Hydraulic Wheel Press.
Cleveland 72″ Multiple Punch—79 ⅝″ holes.
5″ Ajax Forging Machine, steel bed, die slide and header.
Beatty Punch & Shear, 48″ throat.
Cincinnati 32″ Triple Grd. Shaper, M.D., 20″.
10′ Ohl Power Squaring Shear, Cap. 16 ga.
16″ Garrison Power Press Break Cap. 10 gauge
U. S. L. Combination Welder, 200 Amp., 3-60-220, Gasoline Engine.

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One—No. 1 Kempsmith Universal Miller
One—No. 1½ Kearney & Trecker Plain Miller
One—2½′ American Radial Drill.
One—16″ American Shaper
Two—No. 1 Garvin automatic tappers

H. A. SMITH MACHINERY CO.
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Machine Tools

Bullard 60″ Boring Mill.
Giddings No. 32 Horizontal.
Cincinnati-Bickford 3′ Radial.
Cincinnati No. 2 Univ. Miller.
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BUTT - SPOT - SEAM

We are specialists in rebuilt welding machines. Write us for our long list to select from.

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FOR SALE
Watts Campbell 75 H. P. Steam Engine
Never Used
Radio Product Corporation
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MAKE US AN OFFER

1—20″ Gould & Eberhardt Shaper (Excellent Condition).
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Indianapolis, Ind. Surplus Equipment Division

500—BLOWERS—FANS—EXHAUSTERS—500
Spencer Turbine 5400′; Gen'l Elec. 2500′; Root-Connersville, Piqua, Green, Sturtevant, *Positive Pressure Rotary Blowers.* Large stock, all pressures. Fan Types—Am. Blower Co., Buffalo, Sturtevant, Garden City, Clarage, etc. Air Compressors, Receivers, Vacuum Pumps, all purposes. Tremendous Stock. High and Low Pressure. Small and Large Volumes. **Send Specifications.** Reliable *"Wind Jammers"* for every application. MONEY SAVING BARGAINS.
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2—300 H.P. Geary Water Tube Boilers. A No. 1 condition. A.S.M.E. 160 lb.
10 x 10 Ingersoll-Rand ER-1
75 H.P. Westinghouse A.C. Motor 220 V.
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2—6 x 8 Worthington Triplex Pumps.
50 H.P. Bessemer Oil Engine.
6 Ton Brookville Gasoline Locomotive, 36″.

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1—2-ton Shepard 22'6" span 3 motors 550 VAC.
1—5-ton Niles 20'0" span 3 motors 230 VDC.
1—5-ton Box 59'6" span 3 motors 220 VAC.
2—5-ton Maris 60'6" span 3 motors 220 VAC.
2—10-ton Morgan 65'0" span 3 motors 230 VDC.
1—10-ton Northern 71'6" span 3 motors 440 VAC.

2—10-ton Maris 60'6" span 5 motors 220 VAC.
2—10-ton Northern 71'6" span 5 motors 220 VAC.
1—10-ton Cleveland 95'11" 5 motors 230 VDC.
(these 3 cranes have 2 separate 5-ton trolleys each)

1—15-ton P & H 42'10" span 4 motors 440 VAC.
1—15-ton Morgan 50'0" span 4 motors 230 VDC.
1—15-ton Alliance 57'6" span 3 motors 230 VDC.
1—20-ton Niles 65'0" span 4 motors 230 VDC.
1—25-ton Northern 65'0" span 4 motors 230 VDC.
1—35-ton Case 45'0" span 4 motors 550 VDC.
1—40-ton Niles 72'0" span 4 motors 230 VDC.
1—50-ton Alliance 50'0" span 3 motors 220 VAC
1—75-ton Niles 49'0" span 4 motors 440 VAC.

ELECTRIC MONORAIL HOISTS

2—1-ton Shepard 1 motor 230 VDC. pl. trolley.
2—1-ton Sprague 1 motor 230 VDC. hook susp.
2—3-ton Shepard 2 motors 220 VAC form 23-2-PS.
2—5-ton Shepard 2 motors 230 VDC.

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60" Ryerson Heavy Duty Radial Drill (95% new, 3 hp. 220 VAC. elevating motor 7½ hp. spindle motor, 16 spindle speeds.
No. 3 Hilles Jones Guillotine Bar Shear (new) motor driven 21" knives, cap (5) 1¼" square bars, wt. 21,000 lbs.
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25' Sellers Vert. Boring Mill, 35 & 5 hp. 230 VDC. var. speed motors, wt. 300,000 lbs.
No. 5 Ryerson steel frame double end Punch and Shears, (95% new) 220 VAC. motor drive, wt. 30,500 lbs.

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1—2350 cu. ft. Worth. Fthr. vlve...3/60/2200
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1—1584 cu. ft. Chgo. Pneu. OCE...3/60/2200
1—1302 cu. ft. Ing. Rand Pre-2...3/60/220
1—1250 cu. ft. Worth. Fthr. vlve...3/60/550/2200
1—1050 cu. ft. Sullivan 3/60/440
1— 807 cu. ft. Sullivan 3/60/440
1— 676 cu. ft. Ing. Rand XRE-2.3/60/440
1— 676 cu. ft. Worth. Fthr. vlve...3/60/440
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Complete line of smaller sizes.

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Every unit guaranteed throughout when shipped

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Shops and Warehouses—Jersey City, N. J.

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A. C. MOTORS
3 Phase, 60 Cycle

H.P.	Make	Volts	Type	Speed
1—600	G. E.	440/220	TSSynch	360
1—600	G. E.	550/440	IM-Slip Ring	1200
1—500	Allis	2200/550	ANY-Slip Ring	505
1—300	West.	440/220	G-Synch.	600
2—300	G. E.	2300	IP-Slip Ring	514
1—200	West.	440/220	CW-Slip Ring	500
2—200	F.Mor.	440/220	BV-Slip Ring	600
1—150	G. E.	440/220	IK-Sq. Cage	1200
10—100	West.	550	CS-Sq. Cage	700
2—100	West.	220	CS-Sq. Cage	720
1— 82	G. E.	440/220	ITC-M-SI. Ring	495
1— 75	G. E.	440/220	MT-Slip Ring	685
1— 70	G. E.	220/440	ATI-SYNCH.	1200

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1—185 K.W. G. E. Type HCC—125-250/275 v., 3 ph., 60 cy., 1200 r.p.m. Fully complete with 3-80 K. V. A. 2070/2300-4000 V. transformers and 3 wire S.B.

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10-ton Niles overhead crane, 56'-6" span, with A.C. motors. Extra aux. hoist.
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Splendid steel building frame, 60'x200', with or without 10-ton crane and runway.
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1 to 5-ton hand chain hoists and cranes, good.

The Above Stock Items at Very Attractive Prices NOW.

Also available—
3 to 75-ton capacity overhead electric and hand cranes, with spans from 14-ft. to 98-ft., A.C. and D.C., Shepard, P. & H., Niles, Morgan, Shaw, Sprague, Alf. Box, Alliance, Whiting, Milwaukee, Case, Cleveland and Northern makes.
Large GANTRY and LADLE cranes; also some very fine GRAB BUCKET cranes, all at remarkable values.

Telephone, wire or write for details.
Send us your specifications
See page 170

A. C. and D. C. CRANES
50T. 50'; 30T. 72' and 25T. 75' Spans A.C.
100 Ton Crane—47' Span; 6 motors, D.C.
15T. 5' Span—4 motors 220 V. D.C.
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2400 KW-AC. Corliss Eng. Set
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We rewind and repair lifting magnets. The following sizes are in stock: 12", 18", 30", 36", 45".

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13—CRANES—CRANES—CRANES—13

For immediate disposal offer 13 Morgan & Alliances 220 VDC consisting of 9-10 ton 40'-50'-57'-6"-62'-75' span, 1-15 ton 57'-6" span, 2-30 and 1-25 ton 50' span 4 motor. Send for full specifications.

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BY SEALED BIDS TO BE OPENED BY THE

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11:00 A.M. (Eastern Standard Time)

10 JANUARY 1931

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Description

Location.....Navy Yard, Philadelphia, Pa.
Length over all.....314' 4"
Length between perpendiculars.....310' 0"
Breadth on load water line.....30' 11⅝"
Mean draft.....9' 4"
Displacement (normal).....1215 tons
Hull.....Steel
Type.....Destroyer
Built by Bethlehem Shipbuilding Corporation
Date built.....1919

U.S.S. MAHAN
U.S.S. MAURY

Description

Location.....Navy Yard, Philadelphia, Pa.
Length over all.....314' 4"
Length between perpendiculars.....310' 0"
Breadth on load water line.....30' 11"
Mean draft.....9' 2"
Displacement (normal).....1191 tons
Hull.....Steel
Type.....Light Minelayer
Built by Fore River Shipbuilding Corporation
Date built.....1918

Catalog No. 365-B, containing descriptions, terms and conditions of sale, etc., may be obtained from the Commandant, Navy Yard, Philadelphia, Pa., or from the

BUREAU OF SUPPLIES AND ACCOUNTS
NAVY DEPARTMENT
WASHINGTON, D. C.

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1—35 Ton H. K. Porter Saddle Tank Locomotive, 180 lbs. steam pressure, Standard Gauge.
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2—Size No. 5 Gould Centrifugal Pumps, G.P.M. 800, Head 93 ft. R.P.M. 1700, mounted on a cast iron base plate. With or without 40 H.P. D.C. Motors.
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6—Lakewood All Steel V Dump Cars, 24" Gauge, 1 yd. Capacity.
11—Lakewood All Steel Platform Cars, 24" Gauge, 4 ton Capacity.
10—5 and 10 ton capacity Overhead Traveling Cranes, D.C., 230 Volts Cage Control.
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2—300 H.P. Atlas Boilers, 150 lbs. Pressure.
1—Feed Water Heater 2500 H.P., Size No. 5.
1—United Engineering & Foundry Co. 18" Hydraulic Accumulator 7' 7" Stroke, 12' 0" Ram.
1—Sturtevant Type "M" Staggered Tube Economizer.
1000 KW D.C. Westinghouse Turbo Generator with Condenser.
500 KW D.C. Westinghouse Low Pressure Turbo Generator with Condenser.
500 KW D.C. Westinghouse Generator direct connected to Buckeye Automatic Cross Compound Engine, 800 H.P.
1—Steam Driven Air Compressor, Ingersoll Rand, Class Imperial X B 2.

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2—3500, 1—4500, 1—8600, 1—10,000 gal. cap.

Steel Buildings, Crane Runways, and Crane Girders. Specifications and blue prints available for all items.

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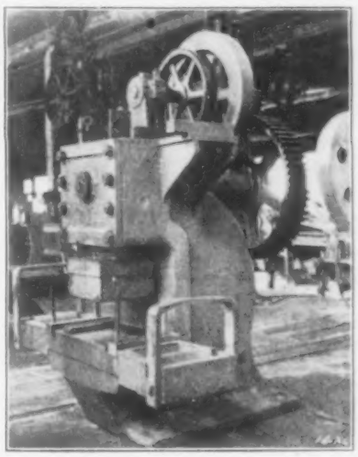
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NEW-RECLAIMED-USED
PIPE
ALL SIZES CUT TO SKETCH AND STOCKED
BERRY & NORTH 13th STS.
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Rebuilt and in First Class Condition

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50 lb. 60 lb. 70 lb. 85 lb.
A.S.C.E. SECTIONS
5000 tons immediate shipment
M. K. FRANK
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RAILS NEW & RELAYING ALL WEIGHTS

Please advise weight per yard and tonnage you want. We may have same in stock right near you. We can make very low prices on New Frog and Switch Material; also second hand Locomotives.

We buy Rails fit to relay.

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HENRY POTTS & CO.

Iron & Steel Scrap
Dismantling

Bankers Trust Building
PHILADELPHIA, PA.
Yard: Coatesville, Pa.

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Power Operated Bending Machine

for bending pipe up to 2½" diameter 26" radius. Give complete details.

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McCabe Flanging Machine—¾"

Pneumatic Riveter, 10" Gap; Capacity 1" Rivets. Must be good. State full details in first letter, age, condition, price and location for inspection.

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A 7" x 6" Ingersoll-Rand Type ER-I or equivalent Chicago Pneumatic Tool Co.'s stationary belt driven air compressor. Must be in perfect condition.

SMITH-STEWART CO.
Newburgh, N. Y.

1—Cutting Off Machine for 8" to 10" diameter. Must be in good operating condition.

1—Modern Type Horizontal Boring Machine, about 6" spindle.

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We are in the market for Doeltzer & Kirsten No. 2 Shear for scrap iron use. Must be late type and in first class condition. Advise immediately description and lowest price. We will arrange inspection.

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Seamless and Welded Steel Tubing
Steel Pipe
Mail us your surplus lists.
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developed machine or a proposition of outstanding merit?

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DO YOU NEED
increased facilities or capital to manufacture and expand your market?

WE HAVE THE
men — machinery — materials — money—and can assist you in expanding your market. If your proposition has real merit we would like to talk it over with you—why not get together?

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COLD ROLLED PRESTEEL STRIP STEEL

DEEP DRAWING
STAMPINGS ALL METALS
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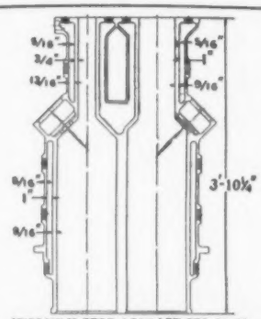
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An exceptional buy. 400 ton monthly capacity shop on leased ground. A going successful business, earnings averaging $2,000.00 annually, is for sale; owner retiring. Wonderful opportunity for experienced party. $25,000 will handle this proposition.

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Responsible Manufacturers' Agent, with office in Los Angeles, solicits a few additional Eastern-made lines to represent on Pacific Coast. Can assure dignified, active and intelligent representation. Commission basis.

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If you are qualified for position between $2,500 and $25,000, and are receptive to negotiations for new connection, your response to this announcement is invited. The undersigned provides a thoroughly organized service, established twenty-one years ago, to conduct confidential preliminaries and assist the qualified man in locating the particular position he desires. Not a registration bureau. Retaining fee protected by refund provision, as stipulated in our agreement. Send name and address only for description of service. **R. W. Bixby, Inc., 274 Main St., Buffalo, N. Y.**

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We Specialize in Specialists

TO EMPLOYEES: We need Works Managers, Superintendents, Engineers and Designers, Chemists and Metallurgists and Foundry men; also Office and Sales Executives and Sales Engineers. Send for application. No advance charges.

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PERSONNEL COUNSELLORS
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OVER 17 YEARS

SITUATIONS WANTED

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GRADUATE MECHANICAL ENGINEER. Married. Experienced machinist, machine designer, maintenance engineer, and steam and combustion engineering, with good record of improvemets in manufacturing processes also labor and fuel savings. Capable of handling men. Desires connection with company where hard work and results count. Address Box G-700 care *The Iron Age*, 239 W. 39th St., New York, N. Y.

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GENERAL MANAGER—General Executive will be available February 1st for service in an industrial administrative or reorganization capacity. Applicant has well rounded business experience and ability to direct a program of market diversification, products development and cost reduction. Age 46. Experience record and unquestionable references can be furnished. Address Box G-653, care *The Iron Age*, 239 W. 39th St., New York.

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Each additional word 6c

All capitals, minimum 50 words.....$4.50
Each additional word 9c

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Each additional word 12c

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Janney, Joseph A., Jr., Phila.
Scaife, William B., & Sons Co., Ptgh.

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ALLOYS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

ALLOYS—Silico-Manganese
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Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

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Vanadium Corp. of America, 120 B'way., N. Y. C.

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Vanadium Corp. of America, 120 B'way., N. Y. C.

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Phoenix Iron Co., Phila.
Republic Steel Corp., Youngstown, Ohio.
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Sweet's Steel Co., Williamsport, Pa.
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Republic Steel Corp., Youngstown, Ohio.
Sharon (Pa.) Steel Hoop Co.

BANDS—Welded
Amer. Welding & Mfg. Co., Warren, O.

BARGES—Steel
American Bridge Co., 71 B'way., N. Y. C.

BARRELS—Burnishing
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Bridgeport, Conn.
Globe Mach. & Stpg. Co., Cleveland
Ransohoff, N., Inc., Cincinnati, Ohio.

BARRELS—Steel Shop
Cleveland (O.) Wire Spring Co.

BARRELS—Tumbling—See Tumbling Barrels

BARS—Alloy
Allegheny Steel Co., Brackenridge, Pa.
Bethlehem (Pa.) Steel Co.
Republic Steel Corp., Youngstown, Ohio.

BARS—Cast Bronze
Buckeye Brass & Mfg. Co., Cleveland

BARS—Concrete, Reinforcing
Laclede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Phila.
Scullin Steel Co., St. Louis, Mo.
Sweet's Steel Co., Williamsport, Pa.

BARS—Manganese Steel
Manganese Steel Forge Co., Phila.

BARS—Steel
Ames, W. & Co., Jersey City, N. J.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.
Carnegie Steel Co., Pittsburgh.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago.
Philadelphia (Pa.) Steel & Iron Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago
Scullin Steel Co., St. Louis, Mo.
Timken Steel & Tube Co., Canton, Ohio.
Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

BASKETS—Pickling
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BATTERIES—Storage
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BATTERY—Chargers
Cutler-Hammer, Inc., Milwaukee

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BEARING METAL
Stewart Die-Casting Corp., Chicago.

BEARINGS—Ball
Auburn Ball Bearing Co., Rochester, N. Y.
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., Poughkeepsie, N. Y.
Hyatt Roller Bearing Co., Newark, N. J.
New Departure Mfg. Co., Bristol, Ct.
Norma-Hoffmann Bearings Corp., Stamford, Ct.
S. K. F. Industries, Inc., 10 E. 34th St., New York City.
Standard Machinery Co., Auburn, R. I.

BEARINGS—Brass and Bronze
Buckeye Brass & Mfg. Co., Cleveland.
Erie (Pa.) Bronze Co.
Lumen Bearing Co., Buffalo, N. Y.
Stewart Die-Casting Corp., Chicago.

BEARINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BEARINGS—Radial
Bantam Ball Bearing Co., South Bend, Ind.
S. K. F. Industries, Inc., 10 E. 34th St., New York City.

BEARINGS—Roller
Bantam Ball Bearing Co., South Bend, Ind.
Federal Bearings Co., Inc., Poughkeepsie, N. Y.
Hyatt Roller Bearing Co., Newark, N. J.
Norma-Hoffmann Bearings Corp., Stamford, Ct.
Standard Machinery Co., Auburn, R. I.

BEARINGS—ROLLER TAPERED
Timken Steel & Tube Co., Canton, Ohio.

BEARINGS—Self-Lubricating
Johnson, Carlyle Mch. Co., Manchester, Conn.

BEARINGS—Shaft Hanger
Fafnir Bearing Co., New Britain, Conn.
S. K. F. Industries, Inc., 10 E. 34th St., New York City.

BEARINGS—Thrust
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Ct.
Standard Mchry. Co., Auburn, R. I.
S. K. F. Industries, Inc., 10 E. 34th St., New York City.
Timken Steel & Tube Co., Canton, Ohio.

BELT FASTENERS
Smith, F. P., & Co., Sharon Hills, Pa.

BELT STRETCHERS
Norris Bros., Inc., Robinson, Ill.

BELTING—Chain
Morse Chain Co., Ithaca, N. Y.

BELTING—Conveyor
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

BELTING—Leather
Chicago (Ill.) Rawhide Mfg. Co.

BELTING—For Grooved Pulleys
Dayton (Ohio) Rubber Mfg. Co., The.

BELTING—Rubber
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

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Standard Pressed Steel Co., Jenkintown, Pa.

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Buffalo (N. Y.) Forge Co., 492 B'way.
Galland-Henning Mfg. Co., Milwaukee
Hossfeld Mfg. Co., Winona, Minn.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn., N. Y.
Thomas Sparing Mach. Co., Ptgh.

BENDING MACHINES, BAR—Circle or Spiral
Hossfeld Mfg. Co., Winona, Minn.
Kardong Bros., Inc., Minneapolis, Minn.

BENDING MACHINES—Hand and Power
American Pipe Bending Mch. Co., Boston.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cincinnati (O.) Shaper Co., The.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krumm Mfg. Co., Chicago.
Hossfeld Mfg. Co., Winona, Minn.
Kane & Roach, Syracuse, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Yoder Co., The, Cleveland, O.

BILLETS—Alloy Steel
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Co.

BILLETS—Carbon Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Carbon Vanadium Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Chrome Nickel Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Die Block Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Forging
Andrews Steel Co., Newport, Ky.
Bethlehem (Pa.) Steel Co.
Central Iron & Steel Co., Harrisburg, Pa.
Heppenstall Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
Republic Steel Corp., Youngstown, Ohio.

BILLETS—Nickel Steel
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Republic Steel Corp., Youngstown, Ohio.

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Andrews Steel Co., Newport, Ky.

BILLETS—Steel
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Bethlehem (Pa.) Steel Co.
Central Iron & Steel Co., Harrisburg, Pa.
Inland Steel Co., Chicago.
Republic Steel Corp., Youngstown, Ohio.
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BLANKS—Brass and Copper
Bridgeport (Conn.) Brass Co.

BLANKS—Gear & Pinion
Bethlehem (Pa.) Steel Co.
Chicago (Ill.) Rawhide Mfg. Co.
Edgewater Steel Co., Pittsburgh.

BLANKS—Gear & Pinion, Upset Forged
Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.

BLAST FURNACE SPECIALTIES
Brostus, Edgar E., Inc., Sharpsburg P. O., Ptgh.

BLOCKS—Chain
Wright Mfg. Co., Bridgeport, Conn.

BLOCKS—Creosoted
Jennison-Wright Co., Toledo.

BLOWERS—Centrifugal
General Electric Co., Schenectady, N. Y.

BLOWERS—Pressure
Anthony Co., Long Island City, N. Y.
Buffalo (N. Y.) Forge Co., 492 B'way.
Champion Blower & Forge Co., Lancaster, Pa.
Chicago (Ill.) Flexible Shaft Co.

BLOWERS—Rotary Positive
Connersville (Ind.) Blower Co., Inc., The.
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BOILER HEADS—Flanged and Dished
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BOLT CUTTERS
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Landis Mch. Co., Inc., Waynesboro, Pa.
National Mchry. Co., Tiffin, Ohio.

BOLT AND NUT MACHINERY
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Keystone Engng. Co., The, Willoughby, O.
Landis Machine Co., Inc., Waynesboro, Pa.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage & Machine
Lamson & Sessions Co., The, Cleveland, O.
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Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

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Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.

BOLTS—Special, Hot or Cold Upset
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Stove
Lamson & Sessions Co., The, Cleveland, O.

BOLTS—Track
Inland Steel Co., Chicago.
Pittsburgh (Pa.) Screw & Bolt Corp.
Sweet's Steel Co., Williamsport, Pa.

BOLTS AND NUTS
Ames, W., & Co., Jersey City, N. J.
Bell, David, Co., Inc., The, Buffalo, N. Y.
Bethlehem (Pa.) Steel Co.
Clark Bros. Bolt Co., Milldale, Conn.
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Neely Nut & Bolt Co., Ptgh.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Pittsburgh (Pa.) Screw & Bolt Corp.
Reed & Prince Mfg. Co., Worcester, Mass.
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United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.

BOND—Grinding Wheel
Bakelite Corp., 247 Park Ave., N. Y. C.

BORING, DRILLING AND MILLING MACHINES—Horizontal
Barnes, W. F., & John Co., Rockford, Ill.
Defiance (O.) Mch. Wks.
Lucas Machine Tool Co., Cleve.
National Automatic Tool Co., Richmond, Ind.
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Petroleum Iron Wks. Co., Sharon, Pa.
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BRICK—Cast—High Temperature
Corhart Refractories Co., Inc., Louisville, Ky.

BRICK—Chrome
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Harbison-Walker Refractories Co., Pitgh.
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BRICK—Fire Clay
Carborundum Co., The, Niagara Falls, N.Y.
General Refractories Co., Philadelphia.
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Kier Fire Brick Co., Pittsburgh.
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Taylor, Chas., Sons Co., Cincinnati, O.

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Harbison-Walker Refractories Co., Pitgh.
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Blaw-Knox Co., Pittsburgh.
McClintic-Marshall Co., Pittsburgh.

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Best, W. N., Corp., 295 5th Ave., N. Y. C.
Freyn Engineering Co., Chicago.
Hauck Mfg. Co., 128 Tenth St., Bklyn, N. Y.
Surface Combustion Co., 2375 Dorr St., Toledo.

BURRS—Steel
Master Products Co., The, 6420 Park Ave. S. E., Cleveland.
Wrought Washer Mfg. Co., Milwaukee.

BUSHINGS—Brass and Bronze
Buckeye Brass & Mfg. Co., Cleveland.
Erie (Pa.) Bronze Co.
Harsch, John, Bronze & Fdry. Co., Cleveland.
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Air Reduction Sales Co., 60 East 42nd St., N. Y. C.

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Easton (Pa.) Car & Construction Co.

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CASTERS—Industrial Truck
Colson Co., The, Elyria, Ohio.

CASTINGS—Acid or Heat Resisting
Harsch, John, Bronze & Fdry. Co., Cleveland.
Hoskins Mfg. Co., Detroit.
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Bethlehem (Pa.) Steel Co.
Bonney-Floyd Co., The, Columbus, Ohio.
Lebanon (Pa.) Steel Fdry.
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West Steel Casting Co., The, Cleveland.

CASTINGS—Aluminum
Harsch, John, Bronze & Fdry. Co., Cleveland.

CASTINGS—Brass, Bronze, Copper or Aluminum
Bethlehem (Pa.) Steel Co.
Buffalo (N. Y.) Bronze Die Cast Corp
Cadman, A. W., Mfg. Co., Pitgh.
Douglas & Lomason Co., Detroit.
Erie (Pa.) Bronze Co.
Harsch, John, Bronze & Fdry. Co., Cleveland.
Lumen Bearing Co., Buffalo, N. Y.
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Snyder, W. P., & Co., Pittsburgh.
Spencer's, L. S., Sons, Inc., Guilford, Ct.
Turner & Seymour Mfg. Co., Torrington, Ct.
York (Pa.) Fdry. & Mch. Co.

CASTINGS—Die
Stewart Die-Casting Corp., Chicago.

CASTINGS—Die, Aluminum Bronze
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CASTINGS—Electric Steel
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Lebanon (Pa.) Steel Fdry.
Maynard Elec. Steel Casting Co., Milw.
Smith, Geo. H., Steel Casting Co., Milw.
Treadwell Engineering Co., Easton, Pa.
West Steel Casting Co., The, Cleveland.

CASTINGS—Gray Iron
Andes, Inc., Lancaster, Pa.
Bethlehem (Pa.) Steel Co.
Connecticut Fdry. Co., The, Rocky Hill, Ct.
Electric Boat Co., Groton, Conn.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Exster, Weiser Co., York, Pa.
Hyde Park (Pa.) Fdry. & Mach. Co.
Kline Hardware Co., Allentown, Pa.
Mechanite Institute, The, Detroit, Mich.
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Moloch Fdry. & Mch. Co., Kaukauna, Wis.
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Poole Engng. & Mch. Co., Balto., Md.
Sessions Foundry Co., The, Bristol, Ct.
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Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Toledo (O.) Mch. & Tool Co.
York (Pa.) Fdry. & Mch. Co.

CASTINGS—High Test and Alloy Iron
Mechanite Institute, The, Detroit, Mich.

CASTINGS—Malleable
Flagg, Stanley G., & Co., Inc., Phila.
Fort Pitt Malleable Iron Co., Pittsburgh.
Link-Belt Co., Indianapolis, Ind.
Malleable Iron Fittings Co., Branford, Ct.
Mechanite Institute, The, Detroit, Mich.
Mesker Foundry Co., Newark, N. J.
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Northern Mal. Iron Co., St. Paul, Minn.
Peoria (Ill.) Malleable Castings Co.
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.
Richmond (Ind.) Malleable Castings Co.
Timken Steel & Tube Co., Canton, Ohio.
Vermilion Mal. Iron Co., Hoopeston, Ill.

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CASTINGS—Semi-Steel
Electric Boat Co., Groton, Conn.
Malleable Iron Fittings Co., Branford, Ct.

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Allegheny Steel Co., Brackenridge, Pa.
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American Rolling Mill Co., Middletown, O.
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Strong Steel Foundry Co., Buffalo, N. Y.
Union Steel Casting Co., Pittsburgh.
Union Switch & Signal Co., Swissvale, Pa.
West Steel Casting Co., The, Cleveland.

CEMENT—Quick Setting, Acid Proof and Insulator
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

CEMENT—Refractory
Carborundum Co., The, Perth Amboy, N. J.
Harbison-Walker Refractories Co., Pitgh.
North American Refractories Co., Cleveland.

CEMENT—Silica and Chrome
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Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CHUCKING MACHINES—Automatic
Baird Mch. Co., Bridgeport, Ct.
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New Britain-Gridley Mch. Co., The, New Britain, Ct.

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National Acme Co., Cleveland.

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CHUCKS—Drill
Cleveland (O.) Twist Drill Co.
Cushman Chuck Co., Hartford, Conn.

CHUCKS—Lathe
Cushman Chuck Co., Hartford, Conn.
Hoggson & Pettis Mfg. Co., New Haven, Ct.
Union Mfg. Co., New Britain, Conn.
Whitton, D. E., Mch. Co., New London, Ct.

CIRCLES—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.

CLAY GUNS
Brosius, Edgar E., Inc., Sharpsburg P. O., Pittsburgh.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Ford, J. B., Co., Wyandotte, Mich.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.
Oakite Prod., Inc., 22 Thames St., N.Y.C.

CLEANING MATERIALS—Glass
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

CLUTCHES—Friction
Caldwell, W. E., Co., 260 Brandeis Street, Louisville, Ky.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Johnson, Carlyle, Mch. Co., Manchester, Ct.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

CLUTCHES—Magnetic
Cutler-Hammer, Inc., Milwaukee
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., 626 So. 28th St., Milwaukee.

CLUTCHES—Reverse
Johnson, Carlyle, Mch. Co., Manchester, Conn.

COAL
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.

COAL, ORE AND ASH HANDLING MACHINERY
Alliance (O.) Machine Co.
Bartlett, C. O. & Snow Co., Cleveland.
Hayward Co., The, 50 Church St., N.Y.C.
Link-Belt Co., Chicago.
Wellman Engineering Co., Cleveland.

COILING MACHINES—Metallic, Hose, Speedometer, Casing, Resistance Coils, Wire Spirals, Etc.
Sleeper & Hartley, Inc., Worcester, Mass.

COILS—Pipe
Cornell & Underhill, Spring & Greenwich Sts., New York City.
Hugh Co., Inc., Buffalo, N. Y.

COKE—Metallurgical
Cleveland (O.) Cliffs Iron Co.
Hillman Coal & Coke Co., Pitgh.
Rogers Brown & Crocker Bros., Inc., 21 E. 40th St., N. Y. C.
Walter-Wallingford & Co., Cincinnati, O.

COKE OVEN MACHINERY
Alliance (O.) Machine Co.
Atlas Car & Mfg. Co., Cleve
Wellman Engineering Co., Cleveland.

COLLARS—Spacing for Milling Cutters
Detroit (Mich.) Stamping Co.

COLLETS
Rivett Lathe & Grinder Corp., Boston

COMPRESSORS—Air
Bury Compressor Co., Erie, Pa.
De Laval Steam Turbine Co., Trenton, N. J.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 B'way., N. Y. C.
Penna Pump & Compressor Co., Easton, Pa.
Sullivan Mchry. Co., Chicago.

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Bury Compressor Co. Erie, Pa.
Penna Pump & Compressor Co., Easton, Pa.

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Austin Co., The, Cleveland.

CONCRETE REINFORCEMENT
American Steel & Wire Co., Chicago.

CONDENSERS—Surface & Jet
Ingersoll-Rand Co., 11 B'way., N. Y. C.

CONDUCTOR PIPE
Newport (Ky.) Rolling Mill Co.

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Austin Co., The, Cleveland.

CONTRACTORS' SUPPLIES — Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc., Berry & N. 13th Sts., Bklyn., N. Y.

CONTROLLERS—Crane
Cutler-Hammer, Inc., Milwaukee

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Cutler-Hammer, Inc., Milwaukee
General Electric Co., Schenectady, N. Y.

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Clark Controller Co., The, Cleveland, O.
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Electric Controller & Mfg. Co., Cleve.

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Brown Instrument Co., Philadelphia.
Wilson-Maeulen Co., Inc., 738 E. 143rd St., N. Y. C.

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Mathews Conveyer Co., Ellwood City, Pa.
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Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Smith, F. P., & Co., Sharon Hills, Pa.
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Whitman & Barnes, Inc., Detroit.

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Veeder-Root, Inc., Hartford, Ct.

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Veeder-Root, Inc., Hartford, Ct.

COUPLINGS—Air Hose
Cleveland (O.) Pneumatic Tool Co., The.
Hunt, C. B., & Son, Salem, Ohio.

COUPLINGS—Cut-off, Friction
Johnson, Carlyle, Mch. Co., Manchester, Ct.

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Boston Gear Works Sales Co., Norfolk Downs, Mass.
Clark Controller Co., The, Cleveland, O.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Poole Engng. & Mch. Co., Balto., Md.

COUPLINGS—Friction Clutch
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

COUPLINGS—Pipe
Hunt, C. B., & Son, Salem, Ohio.

COUPLINGS—Shaft
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

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Link-Belt Co., Chicago.
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CRANES—Electric, Industrial Truck Mounted
Elwell-Parker Elec. Co., Cleveland

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Cleveland Crane & Engng. Co., Wickliffe, O.
Harnischfeger Corp., Milwaukee.
Lakeside Bridge & Steel Co., 103 Villard Ave., Milwaukee, Wis.
Manning, Maxwell & Moore, Inc., 100 E. 42nd Street, N. Y. C.
Milwaukee (Wis.) Electric Crane & Hoist Corp.
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Reading (Pa.) Chain & Block Corp.
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CRANES—Locomotive
Link-Belt Co., Chicago.
Ohio Locomotive Crane Co., Bucyrus, O.
Orton Crane & Shovel Co., Chicago.

CRANES—Monorail
American MonoRail Co., The, Cleveland.
Cleveland Electric Tramrail, Wickliffe, O.
Reading (Pa.) Chain & Block Corp.
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CRANES—Portable Electric
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CRANES—Wall
Manning, Maxwell & Moore, Inc., 100 E. 42nd St., New York City.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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Streine Tool & Mfg. Co., New Bremen, O.

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CRUSHERS—Steel Turning
American Crusher & Machinery Corp 853 B'dway, N. Y. C.
American Pulverizer Co., St. Louis, Mo.

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Morgan Engineering Co., Alliance, O.
Traylor Engng. & Mfg. Co., Allentown, Pa.

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Newport (Ky.) Rolling Mill Co.

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Brown & Sharpe Mfg. Co., Prov., R. I.
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Michigan Tool Co., Detroit.
Pratt & Whitney Co., Hartford, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.

CUTTING COMPOUNDS
Oakite Prod., Inc., 22 Thames St., N.Y.C.

CUTTING-OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.
Hurlbut Rogers Mchry. Co., The, Nashua, N. H.

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DERRICKS
American-Terry-Derrick Co., South Kearney, N. J.
Hayward Co., The, 50 Church St., N. Y. C.
Lakeside Bridge & Steel Co., 103 Villard Ave., Milwaukee, Wis.
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Bausch & Lomb Optical Co., Rochester, N. Y.

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Bethlehem (Pa.) Steel Co.
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Wetherell Bros. Co., Cambridge, 39, Mass.

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Marquette Tool & Mfg. Co., Chicago.

DIE SINKING MACHINES
Walcott Mch. Co., Jackson, Mich.

DIE SINKING MACHINES—Automatic
Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

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Hoggson & Pettis Mfg. Co., New Haven, Ct.
Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.
Schwerdtle Stamp Co., Bridgeport, Ct.

DIES—Gripping and Heading
Marchant, Geo. F., Co., Chicago.

DIES—Pipe Threading
Bignall & Keeler Mch. Wks., Edwardsville, Ill.
Curtis & Curtis Co., Bridgeport, Ct.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.

DIES—Screw and Thread Cutting
Curtis & Curtis Co., Bridgeport, Ct.
Eastern Mach. Screw Corp., New Haven, Ct.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.

DIES—Self-Opening Adjustable
Consolidated Mch. Tool Corp. of Amerles, Rochester, N. Y.
Eastern Mach. Screw Corp., New Haven, Ct.
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.

DIES—Sheet Metal Working
Adriance Machine Wks., Inc., 82 Richards St., Bkyn., N. Y.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Budd-Ranney Eng. Co., The, Columbus, O.
Cleveland (O.) Punch & Shear Wks. Co.
Ferracute Machine Co., Bridgeton, N. J.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Niagara Mch. & Tool Wks., Buffalo, N. Y.
Toledo (O.) Mach. & Tool Co.
Worcester (Mass.) Stamped Metal Co.
Zeh & Hahnemann Co., Newark, N. J.

DIES—Steel Letters and Stamps
Noble & Westbrook Mfg. Co., Hartford, Ct.

DISCS—Abrasive
Gardner Machine Co., Beloit, Wis.

DOLOMITE
Baker, J. E., Co., York, Pa.

DOORS & SHUTTERS—Fireproof
Cornell Iron Wks., Inc., 71 Marion St., L. I. City, N. Y.
Kinnear Mfg. Co., 817-67 Field Ave., Columbus, Ohio.

DOORS & SHUTTERS—Steel or Wood Rolling
Cornell Iron Wks., Inc., 71 Marion St., L. I. City, N. Y.
Kinnear Mfg. Co., 817-67 Field Ave., Columbus, Ohio.

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Aetna-Standard Eng. Co., Youngstown, O.
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DRILL HEADS—Multiple
Baker Bros., Inc., Toledo, O.

DRILLING MACHINES—Bench
Avey Drilling Mch. Co., Cincinnati.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.

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Baker Bros., Inc., Toledo, O.
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Baker Bros., Inc., Toledo, O.
Barnes, W. F. & John Co., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.

DRILLING MACHINES—Multiple Spindle
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Inc., Rockford, Ill.
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DRILLING MACHINES—Multiple Spindle Adjustable
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DRILLING MACHINES—Multiple Spindle Horizontal
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Multiple, Spindle, Vertical
Avey Drilling Mch. Co., Cincinnati.
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Portable Electric
Cincinnati Electrical Tool Co., Cincinnati, Ohio.

DRILLING MACHINES—Portable Pneumatic
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Helwig Mfg. Co., St. Paul, Minn.

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American Tool Works Co., Cinci.
Cincinnati (O.) Bickford Tool Co.
Cleveland (O.) Punch & Shear Wks. Co.
Thomas Spacing Mch. Co., Pigh., Pa.

DRILLING MACHINES—Rock
Ingersoll-Rand Co., 11 B'way., N. Y. C.

DRILLING MACHINES—Sensitive
Avey Drilling Mch. Co., Cincinnati.
Buffalo (N. Y.) Forge Co., 492 B'way.
Leland-Gifford Co., Worcester, Mass.
Taylor & Fenn Co., Hartford, Ct.

DRILLING MACHINES—Upright
Jaeger, F. W., 110 Liberty St., N. Y. C.

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Baker Bros., Inc., Toledo, O.
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DRIVES—Gear
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Drying Systems, Inc., Chicago, Ill.
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Pangborn Corporation, Hagerstown, Md.
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American Steel & Wire Co., Chicago.
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Sleeper & Hartley, Inc., Worcester, Mass.

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Brassert, H. A., & Co., Chicago.
Freyn Engineering Co., Chicago.
McKee, Arthur G., & Co., Cleve.
Perin & Marshall, 11 West 42nd St., N. Y. C.

ENGINEERS—Foundry
Austin Co., The, Cleveland.

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Austin Co., The, Cleveland.
Criswell, James, Co., Pittsburgh, Pa.
Kennedy, Julian, Pigh.
Freyn Engineering Co., Chicago.
Laughlin, Alex., & Co., Pigh.
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Buffalo (N. Y.) Forge Co., 492 B'way.
Coppus Engineering Corp., Worcester, Mass.

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Booth Felt Co., Inc., The, 677-678 19th St., Bkyn., N. Y.
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FENCES—Woven Wire
American Steel & Wire Co., Chicago.
Page Steel & Wire Co., Bridgeport, Ct

FENCING—Wire
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Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FILES AND RASPS
American Swiss File & Tool Co., Elizabeth, N. J.
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Heller Bros. Co., Newark, N. J.

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American Swiss File & Tool Co., Elizabeth, N. J.

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Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.

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Central Iron & Steel Co., Harrisburg, Pa.

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Hauck Mfg. Co., 128 Tenth St., Bkyn., N. Y.

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Acme Machinery Co., Cleveland.
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Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.
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Cann & Saul Steel Co., Phila.
Erie (Pa.) Forge Co.
Heppenstall Co., Pittsburgh.
National Forge & Ordnance Co., Irvine, Pa.
Steel Improvement & Forge Co., The, 950 Addison Rd., Cleveland.
Vulcan Steam Forging Co., Buffalo, N. Y.

FORGINGS—Brass, Bronze or Copper
Bossert Corp., The, Utica, N. Y.
Commonwealth Brass Corp., Detroit.
National Lock Washer Co., Newark, N. J.
Steel Improvement & Forge Co., The, 950 Addison Rd., Cleveland.

FORGINGS—Bulldozer
Norris Bros., Inc., Robinson, Ill.

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Rockford (Ill.) Drop Forge Co.
Steel Improvement & Forge Co., The, 950 Addison Rd., Cleveland.

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Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Co.
Cann & Saul Steel Co., Phila.
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Cleveland (O.) Hardware Co.
Indianapolis (Ind.) Drop Forging Co.
Keystone Forging Co., Northumberland, Pa.
Laclede Steel Co., St. Louis, Mo.
Milwaukee (Wis.) Forge & Mch. Co.
National Lock Washer Co., Newark, N. J.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Paul, W. P., Co., Phila.
Philadelphia (Pa.) Steel & Iron Co.
Pittsburgh Forgings Co., Coraopolis, Pa.
Queen City Forging Co., Cincy, O.
Rhode Island Tool Co., Providence, R. I.
Rockford (Ill.) Drop Forge Co.
Steel Improvement & Forge Co., The, 950 Addison Rd., Cleveland.
Stormes Drop Forging Co., East Springfield, Mass.
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U. S. Body & Forging Co., Inc., Buffalo, N. Y.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.

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FORGINGS—Hollow
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FORGINGS—Hydraulic Press, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Co.
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FORGINGS—Stainless Steel
Associated Alloy Steel Co., Inc., Cleveland.
Steel Improvement & Forge Co., The, 950 Addison Rd., Cleveland.

FORGINGS—Upset
Amer. Forge Co., 2621 S. Hoyne Ave., Chicago.
Bethlehem (Pa.) Steel Co.
Canton (O.) Forge & Axle Co.
Neely Nut & Bolt Co., Pgh.
Norris Bros., Inc., Robinson, Ill.
Rockford (Ill.) Drop Forge Co.
Steel Improvement & Forge Co., The, 950 Addison Rd., Cleveland.

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FOUNDRY EQUIPMENT AND SUPPLIES
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National Engineering Company, Chicago
Sly, W. W., Mfg. Co., Cleveland, O.

FROGS AND SWITCHES—Railway
Bethlehem (Pa.) Steel Co.
Sweet's Steel Co., Williamsport, Pa.

FURNACES—Billet or Ingot Heating
Surface Combustion Co., 2375 Dorr St., Toledo.
Swindell-Dressler Corp., Box 1753, Pgh.

FURNACES—Blast
Freyn Engineering Co., Chicago.
McKee, Arthur G., & Co., Cleve.
Pennsylvania Engng. Wks., New Castle Pa.

FURNACES—Crucible
Swindell-Dressler Corp., Box 1753, Pgh.

FURNACES—Electric, Steel Melting
Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., 71 B'way., N. Y. C.
Detroit (Mich.) Electric Furnace Co.
General Electric Co., Schenectady, N. Y.
Greene Elec. Furnace Co., Seattle, Wash.
Pittsburgh (Pa.) Electric Furnace Corp.
Swindell-Dressler Corp., Box 1753, Pgh.

FURNACES—Electric, Induction
Ajax Electrothermic Corp., Trenton, N. J.

FURNACES—Enameling
Carborundum Co., The, Perth Amboy, N. J.

FURNACES—Forging
Best, W. N., Corp., 295 5th Ave., N. Y. C.
Chicago (Ill.) Flexible Shaft Co.
Holcroft & Co., Detroit.
Roeswell, W. S., Co., 50 Church St., N. Y. C.
Swindell-Dressler Corp., Box 1753, Pgh.
Surface Combustion Co., 2375 Dorr St., Toledo.

FURNACES—Heat Treating, Automatic
Hevi Duty Electric Co., Milwaukee.
Holcroft & Co., Detroit.
Hyro Mfg. Co., Inc., 205 Varick St., New York City.
Roeswell, W. S., Co., 50 Church St., N. Y. C.
Surface Combustion Co., 2375 Dorr St., Toledo.

FURNACES—Heat Treating, Cyanide or Lead
American Electric Furnace Co., Boston.
Amer. Gas Furnace Co., Elizabeth, N. J.
Chicago (Ill.) Flexible Shaft Co.
Hevi Duty Electric Co., Milwaukee.
Hyro Mfg. Co., Inc., 205 Varick St., New York City.
Surface Combustion Co., 2375 Dorr St., Toledo.

FURNACES—Heat Treating, Electric
Ajax Electrothermic Corp., Trenton, N. J.
American Electric Furnace Co., Boston.
Electric Furnace Co., Salem, Ohio.
General Electric Co., Schenectady, N. Y.
Hevi Duty Electric Co., Milwaukee.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit.
Roeswell, W. S., Co., 50 Church St., N. Y. C.
Strong, Carlisle & Hammond Co., Cleve.
Swindell-Dressler Corp., Box 1753, Pgh.

FURNACES—Heat Treating, Oil or Gas
Amer. Gas Furnace Co., Elizabeth, N. J.
Anthony Co., The, Long Island City, N. Y.
Best, W. N., Corp., 295 5th Ave., N. Y. C.
Chicago (Ill.) Flexible Shaft Co.
Electric Furnace Co., Salem, Ohio.
Holcroft & Co., Detroit.
Hyro Mfg. Co., Inc., 205 Varick St., New York City.
Smythe, S. R., Co., Inc., Pittsburgh.
Roeswell, W. S., Co., 50 Church St., N. Y. C.
Strong, Carlisle & Hammond Co., Cleve.
Surface Combustion Co., 2375 Dorr St., Toledo.
Swindell-Dressler Corp., Box 1753, Pgh.

FURNACES—High-Speed Steel
Ajax Electrothermic Corp., Trenton, N. J.
American Electric Furnace Co., Boston.
Chicago (Ill.) Flexible Shaft Co.
Surface Combustion Co., 2375 Dorr St., Toledo.
Swindell-Dressler Corp., Box 1753, Pgh.

FURNACES—Non-Ferrous Melting
Ajax Electrothermic Corp., Trenton, N. J.
American Electric Furnace Co., Boston.
Detroit (Mich.) Electric Furnace Co.
Greene Elec. Furnace Co., Seattle, Wash.
Surface Combustion Co., 2375 Dorr St., Toledo.

FURNACES—Open Hearth
Criswell, James, Co., Pgh.
Laughlin, Alex., & Co., Pgh.
Smythe, S. R., Co., Inc., The, Pgh.
Stevens, Arthur L., Corp., Chicago.
Swindell-Dressler Corp., Box 1753, Pgh.
Wellman Engineering Co., Cleveland.

FURNACES—Pack Heating Sheets
Wean Engng. Co., Inc., The, Warren, Ohio.

FURNACES—Rivet Heating, Electric
General Electric Co., Schenectady, N. Y.

FURNACES—Rivet Heating, Oil or Gas
Surface Combustion Co., 2375 Dorr St., Toledo.

FURNACES—Wire, Annealing & Galvanizing
General Electric Co., Schenectady, N. Y.
Surface Combustion Co., 2375 Dorr St., Toledo.
Vaughn Mchry. Co., Cuyahoga Falls, O.

FUSE METAL
Platt Bros. & Co., The, Waterbury, Ct.

GAGES—Pressure and Vacuum
Bristol Co., Waterbury, Ct.
Marshalltown (Iowa) Mfg. Co.

GAGES—Thread Lead
Bausch & Lomb Optical Co., Rochester, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.

GALVANIZING
Cattie, Joseph P., & Bros., Phila.

GALVANIZING PLANTS—For Sheets
Aetna-Standard Eng. Co., Youngstown, O.
Erie (Pa.) Foundry Co.
United Engng. & Fdry. Co., Pgh.

GALVANIZING & TINNING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

GAS—Exhausters
Connersville (Ind.) Blower Co., Inc., The.
Roots, P. H. & F. M., Co., The, Connersville, Ind.
Wilbraham-Green Blower Co., Pottstown, Pa.

GAS CLEANING PLANTS
Freyn Engineering Co., Chicago.

GAS PRODUCERS
Duff Patents Co., Inc., Pgh.
Morgan Construction Co., Worcester, Mass.
Swindell-Dressler Corp., Box 1753, Pgh.
Wellman Engineering Co., Cleveland.
Wood, R. D., & Co., Philadelphia.

GAS WASHERS
Brassert, H. A., & Co., Chicago.
Freyn Engineering Co., Chicago.

GASKETS—Asbestos, Metal or Rubber
Garlock Packing Co., The, Palmyra, N. Y.

GASKETS—Felt
Booth Felt Co., Inc., The, 477-478 19th St., Bklyn.
Continental Felt Co., 890 B'way, N. Y. C.

GATES—Blast
Roeswell, W. S., Co., 50 Church St., N. Y. C.

GATES—Fence
American Steel & Wire Co., Chicago.

GATES—Ore Bin
Freyn Engineering Co., Chicago.

GEAR CUTTING
Akron (O.) Gear & Engng. Co.
Bethlehem (Pa.) Steel Co.
Dunbore Mfg. Co., Reading, Pa.
Earle Gear & Machine Co., Phila.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gleason Wks., Rochester, N. Y.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Hindley Gear Co., Phila.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Pittsburgh (Pa.) Rolls Corp.
Philadelphia (Pa.) Gear Works
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Wellman Engineering Co., Cleveland.

GEAR CUTTING MACHINES
Brown & Sharpe Mfg. Co., Prov., R. I.
Gleason Wks., Rochester, N. Y.
Whiton, D. E., Mch. Co., New London, Ct.

GEAR DRIVES—Herringbone
Mackintosh-Hemphill Co., Pittsburgh.

GEAR HOBBING MACHINES
Barber-Colman Co., Rockford, Ill.
Gould & Eberhardt, Newark, N. J.

GEAR PLANING MACHINES
Gleason Wks., Rochester, N. Y.

GEARS—Bevel
Earle Gear & Machine Co., Phila.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gleason Wks., Rochester, N. Y.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Johnson, Carlyle, Mch. Co., Manchester, Ct.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works

GEARS—Cast
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Double Helical Cut
De Laval Steam Turbine Co., Trenton, N. J.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Enclosed Herringbone Transmission
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Friction Clutch
Johnson, Carlyle, Mch. Co., Manchester, Conn.

GEARS—Heat Treated
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gleason Wks., Rochester, N. Y.

GEARS—Herringbone
Earle Gear & Machine Co., Phila.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Mesta Mch. Co., Pittsburgh.
Philadelphia (Pa.) Gear Works

GEARS—Machine Cut
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Gleason Wks., Rochester, N. Y.
Johnson, Carlyle, Mch. Co., Manchester, Conn.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Mackintosh-Hemphill Co., Pittsburgh.

GEARS—Machine Molded
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Poole Engng. & Mch. Co., Balto., Md.

GEARS—Non-Metallic
Akron (O.) Gear & Engng. Co.
Chicago (Ill.) Rawhide Mfg. Co.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, Boston.
Horsburgh & Scott Co., Cleve.
Philadelphia (Pa.) Gear Works

GEARS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago

GEARS—Speed Reducing
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Hindley Gear Co., Phila.
Horsburgh & Scott Co., Cleve.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works
Poole Engng. & Mch. Co., Balto., Md.

GEARS—Spiral
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.

GEARS—Spur
Boston Gear Works Sales Co., Norfolk Downs, Mass.
Earle Gear & Mach. Co., Phila.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.

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Johnson, Carlyle, Mch. Co., Manchester, Conn.
Joner, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Wks.

GEARS—Worm

Akron (O.) Gear & Engng. Co.
Ferguson Gear Co., Gastonia, N. C.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Grant Gear Works, Boston.
Hartford (Ct.) Special Mchry. Co.
Hindley Gear Co., Phila.
Horsburgh & Scott Co., Cleve.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works

GEARS—Worm, Speed Reducers

De Laval Steam Turbine Co., Trenton, N. J
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Philadelphia (Pa.) Gear Works.

GENERATORS—Acetylene

Air Reducing Sales Co., 60 East 42nd St., N. Y. C.

GENERATORS—Electric, Second Hand

Belyea Co., Inc., 147 W. 18th St., N Y. C.

GLUE HEATERS

Dart, E. M., Mfg. Co., Prov., R. I.

GRATING—Flooring, Sidewalk, Etc.

Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.

GRATING—Stair

Blaw-Knox Co., Pittsburgh.

GREASE & OIL CUPS

Gits Brothers Mfg. Co., Chicago.

GREASES

Sun Oil Co., Philadelphia.

GRILLES—Metal Cane

Diamond Mfg. Co., Wyoming, Pa.

GRINDING AND POLISHING MACHINES

Bridgeport (Ct.) Safety Emery Wheel Co., Inc.
Calder, Geo. H., Lancaster, Pa.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Hammond Mchry. Builders, Inc., Kalamazoo, Mich.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.
Springfield Mfg. Co., Bridgeport, Ct.
Sterling Grinding Wheel Co., Tiffin, Ohio.

GRINDING MACHINES—Cutter and Reamer

Thompson Grinder Co., Springfield, O.

GRINDING MACHINES—Cylindrical

Brown & Sharpe Mfg. Co., Prov., R. I.

GRINDING MACHINES—Die

Bignall & Keeler Mch. Wks., Edwardsville, Ill.
Landis Mch. Co., Inc., Waynesboro, Pa.

GRINDING MACHINES—Disc

Gardner Mach. Co., Beloit, Wis.
Production Machine Co., Greenfield, Mass.

GRINDING MACHINES—Drill

Sellers, William, & Co., Inc., Phila.

GRINDING MACHINES—Flexible Shaft

Keller Mechanical Engng. Corp., 78 Washington St., Brooklyn, N. Y.

GRINDING MACHINES—Gear Tooth

Walcott Mch. Co., Jackson, Mich.

GRINDING MACHINES — Machine Knives

Bridgeport (Ct.) Safety Emery Wheel Co., Inc.

GRINDING MACHINES—Portable Pneumatic

Cleveland (O.) Pneumatic Tool Co., The.

GRINDING MACHINES—Portable, Radial Swing

Mummert-Dixon Co., Hanover, Pa.

GRINDING MACHINES—Second Hand

Morey & Co., Inc., 410 Broome St N. Y. C.

GRINDING MACHINES—Spring

Sleeper & Hartley, Inc., Worcester, Mass.

GRINDING MACHINES—Surface

Abrasive Machine Tool Co., F. Prov., R. I.
Blanchard Mach. Co., Cambridge, Mass.
Bridgeport (Ct.) Safety Emery Wheel Co., Inc.
Pratt & Whitney Co., Hartford, Conn.

GRINDING MACHINES—Swing Frame

Safety Grinding Wheel & Mch. Co., The, Springfield, O.

GRINDING MACHINES—Tool

LeBlond, R. K., Mch. Tool Co., Cinn.
Sellers, William, & Co., Inc., Phila.
Taylor & Fenn Co., Hartford, Ct.

GRINDING MACHINES—Universal

Simmons Mach. Tool Corp., Albany, N. Y.
Thompson Grinder Co., Springfield, O.

GRINDING MACHINES—Valve

Defiance (O.) Machine Works

GRINDING MACHINES—Vertical Surface

Blanchard Mach. Co., Cambridge, Mass

GRINDING WHEEL DRESSERS AND CUTTERS

Calder, Geo. H., Lancaster, Pa.

GRINDING WHEELS

Atkins, E. C., & Co., Indianapolis, Ind.
Bakelite Corp., 247 Park Ave., N. Y. C.
Carborundum Co., The, Niagara Falls, N.Y.
New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.
Safety Grinding Wheel & Mch. Co., The, Springfield, O.
Simonds Saw & Steel Co., Fitchburg, Mass.
Springfield Mfg. Co., Bridgeport, Ct.
Sterling Grinding Wheel Co., Tiffin, Ohio.

GUTTERS

Newport (Ky.) Rolling Mill Co.

HACK SAW BLADES—See Saws—Hack Saw Blades

HACK SAW MACHINES

Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis, Ind.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., 1755 State St. Racine, Wis.

HAMMER RAMS

Heppenstall Co., Pittsburgh.

HAMMERS—Air

Nazel Engrg. & Mch. Wks., Phila.

HAMMERS—Belt or Motor Driven (Forg ing)

Barbour-Stockwell Co., Cambridge, Mass.
Bradley, C. C., & Son, Inc., Syracuse, N. Y.
Chambersburg (Pa.) Engng. Co.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
Nazel Engrg. & Mch. Wks., Phila.
Sutton Engng. Co., Ptgh.

HAMMERS—Belt or Motor Driven (Sheet Metal)

Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner), St. Mary's Ohio.
Yoder Co., The, Cleveland.

HAMMERS—Blacksmiths' Forging

Bradley, C. C., & Son, Inc., Syracuse, N. Y.

HAMMERS—Board Drop

Erie (Pa.) Foundry Co.

HAMMERS—Drop

Chambersburg (Pa.) Engng. Co.
Erie (Pa.) Foundry Co.
Miner & Peck Dept. Farrel-Birmingham Co., Inc., Derby, Conn.
Morgan Engng. Co., Alliance, O.
Standard Machinery Co., Auburn, R.I.

HAMMERS—Pneumatic

Cleveland (O.) Pneumatic Tool Co., The
Ingersoll-Rand Co., 11 B'way., N. Y. C.

HAMMERS—Pneumatic Forging

Sullivan Mchry. Co., Chicago.

HAMMERS—Rawhide

Chicago (Ill.) Rawhide Mfg. Co.

HAMMERS—Steam

Erie (Pa.) Foundry Co.
Morgan Engng. Co., Alliance, O.

HANGERS—Factory Door

Myers, F. E., & Bro. Co., Ashland, Ohio

HANGERS—Shaft

American Pulley Co., Philadelphia
Hyatt Roller Bearing Co., Newark, N. J.
Hyman, Joseph, & Sons, Phila.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

HARDNESS TESTING MACHINES

Shore Instrument & Mfg. Co., Inc., Jamaica, L. I., N. Y.
Wilson-Maeulen Co., Inc., 738 E. 143d St., N. Y. C.

HARDWARE—Carriage and Wagon

Clapp, E. D., Mfg. Co., The, 86 S. Division St., Auburn, N. Y.

HEADING MACHINES

National Mchry. Co., Tiffin, Ohio.

HEAT TREATING

General Machine Wks., York, Pa.
Parish Pressed Steel Co., Reading, Pa.

HEATERS—Unit

Buffalo (N. Y.) Forge Co., 492 B'way.

HEATING AND VENTILATING APPARATUS

Buffalo (N. Y.) Forge Co., 492 B'way

HELIUM

Linde Air Prods. Co., The, 30 E. 42nd St., New York City.

HINGES—Wrought Brass Butt

Veeder-Root, Inc., Hartford, Ct.

HINGES—Wrought Steel & Brass

Hager, C., & Sons Hinge Mfg. Co., St. Louis, Mo.

HOBS

Barber-Colman Co., Rockford, Ill.
Michigan Tool Co., Detroit.

HOISTING MACHINES

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y

HOISTS—Air

Duke Engine Co., Grand Rapids, Mich.
Detroit (Mich.) Hoist & Mach. Co.
Hanna Eng. Works, Chicago.
Ingersoll-Rand Co., 11 B'way., N. Y. C.
Ringway, Craig & Son Co., Coatesville, Pa.

HOISTS—Chain

American Monorail Co., The, Cleveland.
Reading (Pa.) Chain & Block Corp.
Union Mfg. Co., New Britain, Conn.
Wright Mfg. Co., Bridgeport, Conn.

HOISTS—Electric

American Crane Co., Inc., The, Friendship, N. Y.
American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
American Monorail Co., The, Cleveland.
Box Crane & Hoist Corp., Phila.
Browning, Victor R., & Co., Inc., Cleveland, Ohio.
Detroit (Mich.) Hoist & Mach. Co.
Euclid (O.) Crane & Hoist Co.
Harnischfeger Corp., Milwaukee.
Mallory Machy. Corp., Baltimore.
Maris Brothers, Inc., Phila.
Payne, N. B., & Co., 25 Church St., N. Y. C.
Reading (Pa.) Chain & Block Corp.
Roeper Crane & Hoist Works, Inc., Reading, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Electric Traveling

American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
Box Crane & Hoist Corp., Phila.
Cleveland Electric Tramrail, Wickliffe, O.
Euclid (O.) Crane & Hoist Co.
Milwaukee (Wis.) Electric Crane & Hoist Corp.
Reading (Pa.) Chain & Block Corp.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—Monorail

American Engineering Co., Aramingo and Cumberland Sts., Philadelphia.
Euclid (O.) Crane & Hoist Co.
Milwaukee (Wis.) Electric Crane & Hoist Corp.
Reading (Pa.) Chain & Block Corp.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOISTS—SKIP

Bartlett, C. O. & Snow Co., Cleveland.

HOLDERS—Nipple

Curtis & Curtis Co., Bridgeport, Ct.

HONING MACHINES

Barnes Drill Co., Inc., Rockford, Ill.

HOOKS—Wire

Titchener, E. H., & Co., Binghamton, N. Y.

HOOPS—Wire

American Steel & Wire Co., Chicago.

HOOPS AND BANDS

Sharon (Pa.) Steel Hoop Co.

HOSE—Air, Oil, Steam & Water

New York Belting & Packing Co., 91-93 Chambers St., N. Y. C.

HYDRANTS—Fire

Kennedy Valve Mfg. Co., Elmira, N. Y.
Wood, R. D., & Co., Philadelphia.

HYDRAULIC MACHINERY

American Fluid Motors Co., 2410 Aramingo Ave., Philadelphia.
Baker Engng. Co., Phila.
Bethlehem (Pa.) Steel Co.
Birdsboro (Pa.) Steel Fdry. & Mch. Co
Chambersburg (Pa.) Engrg. Co.
Dudgeon, Richard, Inc., 24-26 Columbia St., New York City.
Elmes, Chas. F., Engrg. Wks., Chicago.
French Oil Mill Mchry. Co., Piqua, O.
Lake Erie Engrg. Corp., Buffalo, N. Y.
Morgan Engineering Co., Alliance, O.
Southwark Fdry & Mch. Co. Phila.
Watson-Stillman Co., 71 West St., N. Y. C.
Wood, R. D., & Co., Philadelphia.

HYPODERMIC NEEDLE TUBING

Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

ICE HANDLING MACHINERY

Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

INDUCTION STEEL ELECTRIC

Heppenstall Co., Pittsburgh.

INGOT MOLDS

Bethlehem (Pa.) Steel Co.
Gathmann Engineering Co., Baltimore, Md.
Shenango-Penn Mold Co., Pittsburgh.
Shenango Furnace Co., Pittsburgh.
Snyder, W. P., & Co., Pittsburgh.
Valley Mould & Iron Corp., Hubbard, O.

INGOTS—Aluminum

Erdle Perforating Co., Rochester, N. Y.

INGOTS—Phosphor Bronze

Phosphor Bronze Smelting Co., Phila.

INSTRUMENTS—Recording

Bristol Co., Waterbury, Ct.
Brown Instrument Co., Philadelphia.

IRON—Chain

Bethlehem (Pa.) Steel Co.

IRON—(Genuine Open Hearth Iron)

Newport (Ky.) Rolling Mill Co.

IRON—Stainless

Firth-Sterling Steel Co., McKeesport, Pa.

IRON—Staybolt

Burden Iron Co., The, Troy, N. Y.
Bethlehem (Pa.) Steel Co.

IRON OR STEEL—Swedish

Swedish-American Steel Corp., 127 Kent Ave., Brooklyn, N. Y.

JACKS—Hydraulic

Dudgeon, Richard, Inc., 24-26 Columbia St., New York City.

JIGS, FIXTURES, TOOLS, Etc. See Tools, Jigs, Fixtures, Etc.

KEYS—Riveted

Western Wire Prods. Co., St. Louis, Mo.

KEYSEATING MACHINES

Baker Bros., Inc., Toledo, O.

KNURLS

American Swiss File & Tool Co., Elizabeth, N. J.

LACING—Belt, Rawhide or Leather

Chicago (Ill.) Rawhide Mfg. Co.

LAMPS—Mercury Vapor

General Electric Vapor Lamp Co., Hoboken, N. J.

LATHE DOGS

West Steel Casting Co., The, Cleveland.

LATHES—Automatic

Bullard Co., The, Bridgeport, Ct.
Jones & Lamson Mch. Co., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Cinn.
Monarch Mch. Tool Co., The, Sidney, Ohio.
Pratt & Whitney Co., Hartford, Conn.

LATHES—Bench

Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Corp., Boston
South Bend (Ind.) Lathe Works.

LATHES—Camshaft

Walcott Mch. Co., Jackson, Mich.

LATHES—Chucking

Jones & Lamson Mach. Co., Springfield, Vt.

LATHES—Crankshaft

LeBlond, R. K., Mch. Tool Co., Cinn.
Walcott Mch. Co., Jackson, Mich.

LATHES—Engine

American Tool Works Co., Cinci.
Cincinnati (O.) Lathe & Tool Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Jaeger, F. W., 140 Liberty St., N. Y. C.
LeBlond, R. K., Mch. Tool Co., Cinn.
Lodge & Shipley Mch. Tool Co., Cinci.
Monarch Mch. Tool Co., The, Sidney, Ohio.
Osborne & Sexton Mchry. Co., Columbus, O
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
South Bend (Ind.) Lathe Works.
Walcott Mch. Co., Jackson, Mich.

LATHES—Gap Bed

South Bend (Ind.) Lathe Works.

LATHES—Roll

Mesta Mch. Co., Pittsburgh.
United Engrg. & Fdy. Co., Ptgh.

LATHES—Second-Hand

Bath, Cyril J., & Co., Cleveland.
Brownell Mchry. Co., Prov., R. I.
Miles Mchry. Co., Saginaw, W. S., Mich
Morey & Co., Inc., 410 Broome St., N. Y. C.
Russell Mch. Co., Ptgh.
Simmons Mach. Tool Corp., Albany, N. Y.

LATHES—Spinning

Adriance Mach. Works, Inc., 82 Richard St., Brooklyn, N. Y.

LATHES—Turret

Bardons & Oliver, Cleve.
Bullard Co., The, Bridgeport, Ct.
Cincinnati (O.) Lathe & Tool Co.
Jones & Lamson Mch. Co., Springfield, Vt.

LEAD BURNING

Gross Lead Burning & Coating Corp., Cleveland

LEAD-LINED APPARATUS

Gross Lead Burning & Coating Corp., Cleveland

LEATHER—Cup

Chicago (Ill.) Rawhide Mfg. Co.

LEATHER—Hydraulic

Chicago (Ill.) Rawhide Mfg. Co.

LEVELING MACHINES

Wean Engng. Co., Inc., The, Warren, Ohio.

LEVELS—Precision Machine Aligning

Universal Boring Mch. Co., Hudson, Mass.

LIMESTONE—Low Silica

Baker, J. E., Co., York, Pa.

LINING—Converter

Edge Hill Silica Rock Co., New Brunswick, N. J.
Harbison-Walker Refractories Co., Ptgh.
North American Refractories Co., Cleveland.

LINING—Cupola

Edge Hill Silica Rock Co., New Brunswick, N. J.
Harbison-Walker Refractories Co., Ptgh.
North American Refractories Co., Cleveland.

LIQUIDATORS

Llewelyn, Thomas J., & Co., Ptgh.

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Sleeper & Hartley, Inc., Worcester, Mass

LOCOMOTIVES—Electric
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General Electric Co., Schenectady, N. Y.

LOCOMOTIVES—Gasoline
Plymouth (O.) Locomotive Wks.

LOCOMOTIVES—Industrial
Plymouth (O.) Locomotive Wks.
Porter, H. K., Co., Pittsburgh.

LOCOMOTIVES—Steam
Porter, H. K., Co., Pittsburgh.

LOCOMOTIVES—Storage Battery
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LUBRICANTS
Sun Oil Co., Philadelphia.

LUGS—Terminal
Wolverine Tube Co., Detroit.

LUMBER—Creosoted or Zinc Treated
Century Wood Preserving Co., Ptgh.

MACHINE WORK
Ams, Max, Mch. Co., The, Bridgeport, Conn.
Cavagnaro, John J., Harrison, N. J.
Cowdrey Mch. Wks., 30 Summer St., Fitchburg, Mass.
General Mach. Works, York, Pa.
Johnson, Carlyle, Mach. Co., Manchester, Ct.
Moloch Fdry. & Mch. Co., Kaukauna, Wis.
Porter Mch. Co., Inc., Jersey City, N. J.

MACHINERY DEALERS
Bath, Cyril J., & Co., Cleveland.
Brotherhood, Percy M., & Son, 25 Church St., N. Y. C.
Brownell Mchry. Co., Providence, R. I.
Delta Equip. Co., Philadelphia.
Dony, D. E., Rochester, N. Y.
Easley, E. L., Mchry. Co., Chicago.
Emerman, Louis E., & Co., Chicago.
General Mchry. Corp., Boston, Mass.
Johnson, Wm. C., & Sons Mchry. Co. St. Louis, Mo.
Lucas, J. L., & Son, Inc., Bridgeport, Conn.
Lunney, F. J., Amesbury, Mass.
MacCabe, T. B., Philadelphia, Pa.
Marr-Galbreath Mchry. Co., Ptgh.
Midland Steel & Equip. Co., Chicago.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N.Y.C.
O'Brien Mchry. Co., Phila.
Prussian, M., Mchry. Co., Detroit.
Reliance Mchry. Sales Co., Ptgh.
Schoonmaker, A. G., & Sons, Inc., 30 Church St., New York City.
Simmons Mach. Tool Corp., Albany, N. Y.
Smith, H. A., Mchry. Co., Syracuse, N. Y.
Sun Mchry. Co., Inc., Newark, N. J.
Wachs Gregg & Co., Chicago.
West Penn Mchry. Co., Pittsburgh.
White, A. D. Machry. Co., Chicago.

MACHINISTS—Contracting
Konigslow, Otto, Mfg. Co., Cleve.

MAGNESITE—Brick or Dead Burnt
Carborundum Co., The, Niagara Falls, N.Y.
Harbison-Walker Refractories Co., Ptgh.
Lavino, E. J., & Co., Phila.

MAGNETS—Electro Industrial
Dings Magnetic Separator Co., Milwaukee.

MAGNETS—Lifting
Cutler-Hammer, Inc., Milwaukee
Electric Controller & Mfg. Co., Cleve.
Ohio Electric Mfg. Co., Cleve.

MALLETS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co.

MANGANESE METAL
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

MANHOLE STEPS
Nicetown Plate Washer Co., Inc., Phila.

MARKING MACHINES
Noble & Westbrook Mfg. Co., Hartford Ct.

METAL SPECIALTIES
Amer. Spring & Mfg. Corp., Holley, Mich.
Bossert Corp., The, Utica, N. Y.
Cuyahoga Spring Co., Cleve.
Detroit (Mich.) Metal Specialty Corp.
Globe Mach. & Stmp. Co., Cleve.
Hassall, John, Inc., Clay & Oakland Sts., Brooklyn, N. Y.
Torrington (Ct.) Co.
Truscon Steel Co., Pressed Steel Div., Cleveland.
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.

METALINE
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

METALS (Acid and Corrosion Resistant)
Haynes Stellite Co., 30 East 42nd St., N. Y. C.

METERS—Electric Flow—For Steam, Gas, Air or Water
Brown Instrument Co., Philadelphia.

METERS—CO$_2$
Brown Instrument Co., Philadelphia.

MICA SCHIST
Edge Hill Silica Rock Co., New Brunswick, N. J.

MICROSCOPES—Toolmakers
Bausch & Lomb Optical Co., Rochester, N. Y.

MILLING MACHINES—Automatic
Pratt & Whitney Co., Hartford, Conn.

MILLING MACHINES—Horizontal
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Defiance (O.) Mch. Wks.
Kearney & Trecker Corp., Milwaukee.

MILLING MACHINES—Plain
Jaeger, F. W., 140 Liberty St., N. Y. C.
Kearney & Trecker Corp., Milwaukee.

MILLING MACHINES—Planer Type
Sellers, William, & Co., Inc., Phila.

MILLING MACHINES—Second-Hand
Simmons Mach. Tool Corp., Albany, N. Y.

MILLING MACHINES—Universal
Brown & Sharpe Mfg. Co., Prov., R. I.

MILLING MACHINES—Vertical
Reed-Prentice Corp., Worcester, Mass.

MIXING MACHINES—Sand
Bartlett, C. O. & Snow Co., Cleveland.
National Engineering Co., Chicago.

MOLDING MACHINES—Jarring (Air)
Arcade Mfg. Co., Freeport, Ill.
Herman Pneumatic Mch. Co., Pittsburgh.
Nicholls, Wm. H., Co., Inc., 91st Ave. & 126th St., Richmond Hill, N. Y.

MOLDING MACHINES—Rollover (Hand and Power Operated)
Arcade Mfg. Co., Freeport, Ill.
Herman Pneumatic Mch. Co., Pittsburgh.

MOLDING MACHINES—Sand Throwing
Beardsley & Piper Co., Chicago, Ill.

MOLDING MACHINES—Stripping Plate
Nicholls, Wm. H., Co., Inc., 91st Ave. & 126th St., Richmond Hill, N. Y.

MONORAIL SWITCHES AND TURNTABLES
Reading (Pa.) Chain & Block Corp.

MONORAIL—Overhead
American MonoRail Co., The, Cleveland.
Reading (Pa.) Chain & Block Corp.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Century Electric Co., St. Louis, Mo.
Leland Electric Co., The, Dayton, Ohio.
Ohio Electric Mfg. Co., Cleve.

MOTORS—Electric—Fractional H.P.
Ohio Electric Mfg. Co., Cleveland.

MOTORS—Electric, Second-Hand
Belyea Co., Inc., 147 W. 18th St., N. Y.
Delta Equip. Co., Philadelphia.
O'Brien Machry. Co., Phila.

MOULDINGS—Cold Rolled
Britesun, Inc., Chicago.

NAILS—Cement Coated
American Steel & Wire Co., Chicago.

NAILS—Copper
Hassall, John, Inc., Clay & Oakland Sts., Brooklyn, N. Y.

NAILS—Galvanized
American Steel & Wire Co., Chicago.

NAILS—Wire
American Steel & Wire Co., Chicago.
Bethlehem (Pa.) Steel Co.
Hassall, John, Inc., Clay & Oakland Sts., Brooklyn, N. Y.
Youngstown (O.) Sheet & Tube Co.

NEON
Linde Air Prods. Co., The, 30 E. 42nd St., New York City.

NICKEL ANODES—Rolled or Cast
Seymour (Ct.) Mfg. Co.

NITROGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Prods. Co., The, 30 E. 42nd St., New York City.

NUMBERING MACHINES—For Metal
Noble & Westbrook Mfg. Co., Hartford, Ct.

NUT LOCKS
American Gas Accumulator Co., Elizabeth, N. J.
Labbe Mfg. Co., Inc., The, Denver, Colo.

NUT MAKING MACHINERY
Budd-Ranney Eng. Co., The, Columbus, O.
National Mchry. Co., Tiffin, Ohio.

NUTS—Acorn
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Western Screw Products Co., St. Louis

NUTS—Castellated
National Acme Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Western Screw Products Co., St. Louis.

NUTS—Cold Punched
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.

NUTS—Hot Pressed
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Milled
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Pittsburgh (Pa.) Screw & Bolt Corp.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Westfield (Mass.) Nut Co.

NUTS—Semi-Finished
Pittsburgh (Pa.) Screw & Bolt Corp.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Westfield (Mass.) Nut Co.

NUTS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

OIL RETAINERS
Chicago (Ill.) Rawhide Mfg. Co.

OIL STONES
Carborundum Co., The, Niagara Falls, N.Y.

OILS—Cutting
Sun Oil Co., Philadelphia.
Vacuum Oil Co., 61 B'way., N. Y. C.

OILS—Fuel
Sun Oil Co., Philadelphia.
Vacuum Oil Co., 61 B'way., N. Y. C.

OILS—Lubricating
Vacuum Oil Co., 61 B'way., N. Y. C.

ORES—Chrome, Lump and Ground
Harbison-Walker Refractories Co., Ptgh.
Lavino, E. J., & Co., Phila.

ORES—Iron
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.
Pilling & Co., Inc., Phila.
Shenango Furnace Co., Pittsburgh.
Snyder, W. P., & Co., Pittsburgh.

ORES—Manganese
Lavino, E. J., & Co., Phila.

OVENS—Baking
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Surface Combustion Co., 2375 Dorr St., Toledo.
Young Bros. Co., Detroit.

OVENS—Core and Mold
Drying Systems, Inc., Chicago, Ill.
Gehnrich Oven Co., Inc., Long Island City, N. Y.
Holcroft & Co., Detroit.
Young Bros. Co., Detroit.

OVENS—Drying
Detroit (Mich.) Sheet Metal Wks.
Drying Systems, Inc., Chicago, Ill.
Young Bros. Co., Detroit.

OVENS—Enameling and Japanning
Carborundum Co., The, Perth Amboy, N. J.
Drying Systems, Inc., Chicago, Ill.
Surface Combustion Co., 2375 Dorr St., Toledo.
Young Bros. Co., Detroit.

OVERHEAD CARRYING EQUIPMENT—See Monorail—Overhead

OXYGEN
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Linde Air Products Co., The, 30 East 42nd St., N. Y. C.

PACKING—Leather
Chicago (Ill.) Rawhide Mfg. Co.
Watson-Stillman Co., 71 West St., N. Y

PACKING—Metallic
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Sheet, Asbestos or Rubber
Garlock Packing Co., The, Palmyra, N. Y.

PANS—Grinding
National Engineering Co., Chicago.

PATENT ATTORNEYS
Boyle, John, Jr., Washington, D. C.
I. & M. T. S. Co., Hartford, Conn.

PATENTING EQUIPMENT—Wire
Vaughn Mchry. Co., Cuyahoga Falls, O.

PATTERNS—Wood and Metal
Bascom & Co., Troy, N. Y.

PERFORATED METAL
Chicago Perforating Co., Chicago, Ill.
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

PHOSPHOR—Copper
Phosphor Bronze Smelting Co., Phila.

PHOSPHORIZERS
McCullough-Dalzell Crucible Co., Ptgh.

PHOTO MICROGRAPHIC APPARATUS
Bausch & Lomb Optical Co., Rochester, N. Y.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.

PICKLING MACHINES
Aetna-Standard Eng. Co., Youngstown, O.
Mesta Mch. Co., Pittsburgh.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.
Ransohoff, N., Inc., Cincinnati, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem (Pa.) Steel Company.
Cleveland (O.) Cliffs Iron Co.
Hanna Furnace Corp., The, Detroit, Mich.
Lavino, E. J., & Co., Phila.
Pilling & Co., Inc., Phila.
Republic Steel Corp., Youngstown, Ohio.
Rogers Brown & Crocker Bros., Inc., 21 East 40th St., N. Y. C.
Shenango-Penn Mold Co., Pittsburgh.
Shenango Furnace Co., Pittsburgh.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Walter-Wallingford & Co., Cincinnati.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

PILING—Steel Sheet
Bethlehem (Pa.) Steel Company.

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Rathbone, A. B., & J., Palmer, Mass.

PINS—Airbrake
Champion Rivet Co., Cleveland, Ohio.

PINS—Chain
Champion Rivet Co., Cleveland, Ohio.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland, O.

PINS—Coupler
Champion Rivet Co., Cleveland, Ohio.

PINS—Escutcheon
Hassall, John, Inc., Clay & Oakland Sts., Brooklyn, N. Y.

PIPE—Cast Iron, B. & S. and Flanged
Cornell & Underhill, Spring & Greenwich Sts., New York City.
Wood, R. D., & Co., Philadelphia.

PIPE—Chrome Alloy
Babcock & Wilcox Tube Co., 85 Liberty St., N. Y. C.

PIPE—Forged Steel
Kellogg, M. W., Co., The, 225 Bdway., N. Y. C.

PIPE—Genuine Wrought Iron
Keating, E. F., Co., 452 Water St. N. Y. C.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Albert Pipe Supply Co., Inc., Berry and N. 13th St., Bklyn, N. Y.
Atlantic Steel & Pipe Corp., Stewart Ave. & Meadow St., B'klyn., N. Y.
Greenpoint Iron & Pipe Co., Inc., 187-197 Maspeth Ave., Bklyn, N. Y.

PIPE—Riveted Steel
Abendroth & Root Mfg. Co., Newburgh, N. Y.
McClintic-Marshall Co., Pittsburgh.

PIPE—Seamless Steel
Babcock & Wilcox Tube Co., 85 Liberty St., N. Y. C.

PIPE—Spiral Riveted
Abendroth & Root Mfg. Co., Newburgh, N. Y.
Taylor Forge and Pipe Works, Chicago.

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Co.
Jones & Laughlin Steel Corp., Ptgh.
Keating, E. F., Co., 452 Water St., N. Y. C.
Republic Steel Corp., Youngstown, Ohio.
Youngstown (O.) Sheet & Tube Co.

PIPE—Welded, Electric
Republic Steel Corp., Youngstown, Ohio.

PIPE—Wrought Iron
Byers, A. M., Co., Pittsburgh.
Keating, E. F., Co., 452 Water St., N. Y. C.

PIPE BENDING MACHINES
Newbold, R. S., & Son Co., Norristown, Pa.

PIPE BENDS
Hugh Co., Inc., Buffalo, N. Y.
Cornell & Underhill, Spring & Greenwich Sts., New York City.

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Murchey Mch. & Tool Co., 951 Porter St., Detroit.
Newbold, R. S., & Son Co., Norristown, Pa.

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Jarecki Mfg. Co., Erie, Pa.
Landis Mach. Co., Inc., Waynesboro, Pa.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
Pipe Machry. Co., The, Cleveland.
Saunders, D., Sons, Yonkers, N. Y.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

PIPE FITTINGS
Jarecki Mfg. Co., Erie, Pa.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Parker Appliance Co., Cleveland.

PISTON & PISTON RING MACHINES
Cleveland (O.) Automatic Mch. Co., The.

PISTON RODS
Heppenstall Co., Pittsburgh.

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American Tool Works Co., Cinci.
Cleveland (O.) Planer Co., The.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Gray, G. A., Co., Cinci.
Sellers, William, & Co., Inc., Phila.

PLANING MACHINES—Open Side
Cleveland (O.) Planer Co., The.
Gray, G. A., Co., Cinci.

PLANING MACHINES—Second Hand
Miles Mchry. Co., Saginaw, W. S., Mich.

PLATERS' CLEANING COMPOUND
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., 22 Thames St., N. Y.

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Wrought Washer Mfg. Co., Milwaukee.

PLATES—Floor or Cellar Door
Alan Wood Steel Co., Conshohocken, Pa.
American Pressed Steel Co., Phila.
Carnegie Steel Co., Pgh.
Central Iron & Steel Co., Harrisburg, Pa.

PLATES—Iron or Steel
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American Pressed Steel Co., Phila., Pa.
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Bethlehem (Pa.) Steel Company.
Carnegie Steel Co., Pittsburgh.
Central Iron & Steel Co., Harrisburg, Pa.
Illinois Steel Warehouse Co., Chicago.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pgh.
Newport (Ky.) Rolling Mill Co.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

PLATES—Manganese Steel
Manganese Steel Forge Co., Phila.

PLATFORMS—Skid
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

PLUGS—Core Hole
Hubbard, M. D., Spring Co., Pontiac, Mich.

POINTING & THREADING MACHINERY
Economy Engng. Co., The, Willoughby, O.

POLISHING & BUFFING MACHINES
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Divine Brothers Co., Utica, N. Y.
Hammond Mchry. Builders, Inc., Kalamazoo, Mich.

POLISHING MACHINES—Belt
Production Machine Co., Greenfield, Mass.

POLISHING WHEELS
Divine Brothers Co., Utica, N. Y.
Hunt, C. B., & Son, Salem, Ohio.

POSTS—Steel Fence
American Steel & Wire Co., Chicago.

POTENTIOMETERS
Brown Instrument Co., Philadelphia.

POWER TRANSMITTING MACHINERY
American Pulley Co., Philadelphia
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Johnson, Carlyle, Mch. Co., Manchester, Conn.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

POWER UNITS—Gasoline, Electric
Ready-Power Co., Detroit.

PREHEATERS—Air
Blaw-Knox Co., Pittsburgh.

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Marquette Tool & Mfg. Co., Chicago.

PRESSED METAL PARTS
Champion Sheet Metal Co., Inc., Cortland, N. Y.
Detroit (Mich.) Metal Specialty Corp.

PRESSED STEEL PARTS
Bossert Corp., The, Utica, N. Y.
Detroit (Mich.) Metal Specialty Corp.
Metal Specialty Co., 1533 W. Sixth St., Cincinnati.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass
Parish Pressed Steel Co., Reading, Pa.
Pennsylvania Car Co., Kansas City, Kans.
Pressed & Welded Steel Prods. Co., Long Island City, N. Y.
Truscon Steel Co., Pressed Steel Div., Cleveland.
Worcester (Mass.) Pressed Steel Co.

PRESSES—Bending or Straightening
Watson-Stillman Co., 71 West St., N. Y

PRESSES—Die
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Drop
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Standard Machinery Co., Auburn, R. I.

PRESSES—Extrusion
Prosser, Thomas & Son, Widla Dept., 15 Gold St., New York City.
Robertson, John, Co., 123 Water St., Brooklyn, N. Y.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Foot
Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
Baird Machine Co., Bridgeport, Ct.
Shuster, F. B., Co., New Haven, Ct.
Taylor & Fenn Co., Hartford, Ct.
Torrington (Conn.) Mfg. Co.

PRESSES—Forcing
Lucas Mch. Tool Co., Cleve.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Forging
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., Alliance, O.
Torrington (Conn.) Mfg. Co.
United Engineering & Fdry. Co., Pgh.
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Forming and Bending
Cincinnati (O.) Shaper Co., The.
Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Hot and Cold Plate
Watson-Stillman Co., 71 West St., N. Y.

PRESSES—Hydraulic
Bethlehem (Pa.) Steel Co.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Elmes, Chas. F., Engrg. Works, Chicago.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
French Oil Mill Machry. Co., Piqua, O.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio
Lake Erie Engng. Corp., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., Alliance, O.
Robertson, John, Co., 123 Water St. Brooklyn, N. Y.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

PRESSES—Multiple Plunger
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

PRESSES—Power
Adriance Machine Works, Inc., 82 Richards St., Bklyn, N. Y.
Baird Machine Co., Bridgeport, Ct.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati (O.) Shaper Co., The.
Cleveland (O.) Punch & Shear Wks. Co.
Ferracute Machine Co., Bridgeton, N. J.
Hyman, Joseph, & Sons, Phila.
Ley & Nawrath Div. Farrel-Birmingham Co., Inc., Derby, Conn.
Manville, E. J., Mach. Co., Waterbury, Ct.
Marquette Tool & Mfg. Co., Chicago.
Minster (O.) Machine Co.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Works, Buffalo, N. Y.
Ohl, George A., & Co., Inc., Newark, N. J.
Pels, Henry, & Co., 90 West St., N. Y. C.
Standard Machinery Co., Auburn, R. I.
Toledo (O.) Mach. & Tool Co.
V & O Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.
Zeh & Hahnemann Co., Newark, N. J

PRESSES—Roofing and Corrugating
Streine Tool & Mfg. Co., New Bremen, O.

PRESSES—Scrap Bundling
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio
Standard Machinery Co., Auburn, R. I.

PRESSES—Trimming
Erie (Pa.) Foundry Co.
Toledo (O.) Mch. & Tool Co

PROJECTORS—Contour Measuring
Bausch & Lomb Optical Co., Rochester, N. Y.

PULLEY MACHINERY
Avey Drilling Mch. Co., Cincinnati.

PULLEYS—Friction Clutch
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.
Johnson, Carlyle, Mch. Co., Manchester, Conn.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

PULLEYS—Iron, Solid and Split
Caldwell, W. E., Co., 260 Brandeis St., Louisville, Ky.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.

PULLEYS—Magnetic
Cutler-Hammer, Inc., Milwaukee
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., 626 So. 28th St., Milwaukee, Wis.

PULLEYS—Steel, Rim Solid and Split
Hyman, Joseph, & Sons, Phila.

PULVERIZERS
American Pulverizer Co., St. Louis, Mo.
Bartlett, C. O. & Snow Co., Cleveland.
Bethlehem (Pa.) Steel Co.

PULVERIZERS—Coal
Bartlett, C. O. & Snow Co., Cleveland.
Bethlehem (Pa.) Steel Co.

PUMPS—Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee
De Laval Steam Turbine Co., Trenton, N. J.
Ingersoll-Rand Co. (Cameron), 11 B'way., N. Y. C.
Penna. Pump & Compressor Co., Easton, Pa.

PUMPS—Coolant
Tomkins-Johnson Co., Jackson, Mich.

PUMPS—Electric
Myers, F. E., & Bro. Co., Ashland, Ohio

PUMPS—Hand and Power
Myers, F. E., & Bro. Co., Ashland, Ohio

PUMPS—Hydraulic
American Fluid Motors Co., 2410 Aramingo Ave., Philadelphia.
Elmes, Chas. F., Engrg. Works, Chicago.
Galland-Henning Mfg. Co., Milwaukee.
Hydraulic Press Mfg. Co., The, Columbus, Ohio
LaPointe Mch. Tool Co., The, Hudson, Mass.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

PUMPS—Pneumatic Air Lift
Sullivan Mchry. Co., Chicago.

PUMPS—Rotary Positive
Connersville (Ind.) Blower Co., Inc., The.
Roots, P. H. & F. M., Co., The, Connersville, Ind.
Wilbraham-Green Blower Co., Pottstown, Pa.

PUMPS—Vacuum
Bury Compressor Co., Erie, Pa.
Paper & Textile Mchry. Co., The, Sandusky, Ohio.
Penna Pump & Compressor Co., Easton, Pa.
Sullivan Mchry. Co., Chicago.

PUNCHES—Pneumatic
Hanna Engineering Wks., Chicago.

PUNCHES AND DIES
Cleveland (O.) Punch & Shear Wks. Co.
Marchant, Geo. F., Co., Chicago.

PUNCHING AND SHEARING MACHINES
Beatty Mch. & Mfg. Co., Hammond, Ind.
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Hendley & Whittemore Co., Beloit, Wis.
Long & Allstatter Co., Hamilton, Ohio.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Ryerson, Jos. T., & Son, Inc., Chicago.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.
Thomas Spacing Mach. Co., Pgh.
Torrington (Conn.) Mfg. Co.
Whitney Metal Tool Co., Rockford, Ill.

PURIFIERS—Oil
De Laval Steam Turbine Co., Trenton, N. J.
National Acme Co., The, Cleveland.

PURIFIERS—Steam
Blaw-Knox Co., Pittsburgh.

PYROMETERS—Controlling
Brown Instrument Co., Philadelphia.

PYROMETERS—Indicating
Bristol Co., Waterbury, Ct.
Brown Instrument Co., Philadelphia.
Hoskins Mfg. Co., Detroit.
Wilson-Maeulen Co., Inc., 738 E. 143d St., N. Y. C.

PYROMETERS—Recording
Brown Instrument Co., Philadelphia.

RACKS—Industrial Storage
Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

RAIL BONDS
American Steel & Wire Co., Chicago.

RAIL SPLICE BARS
Ames, W., & Co., Jersey City, N. J.
Sweet's Steel Co., Williamsport, Pa.

RAILS
Bethlehem (Pa.) Steel Co.
Frank, M. K., Pittsburgh
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago.
Robinson & Orr, Pittsburgh.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
Weirton (W. Va.) Steel Co.

RAILS—Light Steel
Sweet's Steel Co., Williamsport, Pa.

RAILS—Relaying
Continental Iron & Steel Co., 33 Rector St., N. Y. C.
Frank, M. K., Pittsburgh, Pa.
Perry, Buxton, Doane Co., Boston.
Sherwood, E. C., 48 Church St., N. Y. C.

RAILWAY EQUIPMENT & SUPPLIES
Fort Pitt Malleable Iron Co., Pittsburgh.
Scullin Steel Co., St. Louis, Mo.

REAMERS—Adjustable and Expansion
Barber-Colman Co., Rockford, Ill.
Cleveland (O.) Twist Drill Co.
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, Inc., Detroit.

REFRACTORIES—See Brick—Cement—Facing Clay and Fire Clay

RIDDLES—Foundry
Ludlow-Saylor Wire Co., 600-610 S. Newstead Ave., St. Louis, Mo.

RINGS—Iron or Steel
Akron-Selle Co., Akron, Ohio.
Edgewater Steel Co., Pittsburgh.
Heppenstall Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
Milwaukee (Wis.) Forge & Mch. Co.
Vulcan Steam Forging Co., Buffalo, N. Y.

RINGS—Welded
American Welding & Mfg. Co., Warren, O.

RIVET MAKING MACHINERY
Acme Machinery Co., Cleve.
Manville, E. J., Mach. Co., Waterbury, Ct.
National Mchry. Co., Tiffin, Ohio.

RIVET SETS
Cleveland (O.) Punch & Shear Wks. Co.
Hunter Saw & Mch. Co., 5669 Butler St., Pgh.
Marchant, Geo. F., Co., Chicago.
Whitman & Barnes, Inc., Detroit.

RIVETING MACHINES
Allen, John F., Co., 372 Gerard Ave., N. Y.
Buffalo (N. Y.) Forge Co., 492 B'way.
Hanna Engrg. Works, Chicago.
Shuster, F. B., Co., New Haven, Conn.
Watson-Stillman Co., 71 West St., N. Y.
Wood, R. D., & Co., Philadelphia.

RIVETS
Bethlehem (Pa.) Steel Co.
Champion Rivet Co., Cleveland, Ohio.
Clark Bros. Bolt Co., Milldale, Conn.
Hassall, John, Inc., Clay & Oakland Sts., Brooklyn, N. Y.
Neely Nut & Bolt Co., Pgh.
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., Chicago.

RODS—Drill
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.

RODS—Nickel Silver
Seymour (Ct.) Mfg. Co.

RODS—Phosphor Bronze
Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

RODS—Welding
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Haynes Stellite Co., 30 East 42nd St., N. Y. C.

RODS—Welding, Manganese Steel
Manganese Steel Forge Co., Phila.

RODS—Wire
American Steel & Wire Co., Chicago
Washburn Wire Co., Inc., 118th & Harlem River, N. Y. C.
Washburn Wire Co., Inc., Phillipsdale, R. I.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City
Youngstown (Ohio) Sheet & Tube Co.

ROLL HEATERS—Electric
Freyn Engineering Co., Chicago.

ROLLING MACHINERY—Cold Rolling
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Jaeger, F. W., 140 Liberty St., N. Y. C.
Kane & Roach, Syracuse, N. Y.
Torrington (Conn.) Mfg. Co.
Yoder Co., The, Cleveland.

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Streine Tool & Mfg. Co., New Bremen, O.

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Yoder Co., The, Cleveland.

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Streine Tool & Mfg. Co., New Bremen, O.

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Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
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Hyde Park (Pa.) Fdry. & Mch. Co.
Mesta Mch. Co., Pittsburgh.
Mackintosh-Hemphill Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
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Standard Machinery Co., Auburn, R. I.
Sutton Engng. Co., Pitgh.
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Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdry. Co., Pitgh.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.
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United Engrg. & Fdry. Co., Pitgh.

ROLLS—Bending and Straightening
Bertsch & Co., Cambridge City, Ind.
Bethlehem (Pa.) Steel Co.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Hendley & Whittemore Co., Beloit, Wis.
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Niagara Machine & Tool Works, Buffalo, N. Y.
Southwark Foundry & Machine Co., Phila.
Sutton Engrg. Co., Pitgh.

ROLLS—Brass, Bronze, Copper, Iron, Monel, Aluminum
Paper & Textile Mchry. Co., The, Sandusky, Ohio.

ROLLS—Galvanizing
Erie (Pa.) Forge Co.

ROLLS—Sand Chilled Iron and Steel
Aetna-Standard Eng. Co., Youngstown, O.
American Steel Foundries, Chicago.
Birdsboro (Pa.) Steel Fdry. & Mch. Co.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hyde Park (Pa.) Fdry. & Mach. Co.
Mesta Mch. Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.
Pittsburgh (Pa.) Rolls Corp.
United Engrg. & Fdry. Co., Pittsburgh.

ROLLS—Special Hardened
Bethlehem (Pa.) Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.
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ROOFING—Concrete
Austin Co., The, Cleveland.

ROOFING—Special Copper Bearing Steel
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American Rolling Mill Co., Middletown, O.
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Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

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ROOFING AND SIDING—Iron and Steel
Newport (Ky.) Rolling Mill Co.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.

RUST REMOVING
American Chemical Paint Co., Ambler, Pa.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

SAFETY DEVICES & SUPPLIES
Welsh Acetylene Co., Detroit.

SAND—Core
Industrial Silica Corp., Youngstown, Ohio.

SAND—Furnace Bottom
Industrial Silica Corp., Youngstown, Ohio.

SAND—Sand Blast
Cape May (N. J.) Sand Co.
Industrial Silica Corp., Youngstown, Ohio.
Patch-Wegner Co., Inc., Rutland, Vt.

SAND—Steel Molding
Cape May (N. J.) Sand Co.
Industrial Silica Corp., Youngstown, Ohio.

SAND BLAST EQUIPMENT AND MACHINES
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Mott Sand Blast Mfg. Co., Inc., Chi.
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., Cleveland, O.

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Bartlett, C. O. & Snow Co., Cleveland.

SAND HANDLING EQUIPMENT
Bartlett, C. O. & Snow Co., Cleveland.
Beardsley & Piper Co., Chicago, Ill.
Hayward Co., 50 Church St., N. Y. C.
National Engineering Co., Chicago.

SAND MILLS
Bartlett, C. O. & Snow Co., Cleveland.
National Engineering Co., Chicago.

SAW SHARPENING MACHINES
Hagen, H. J., 109 Lafayette St., N. Y. C.

SAWING MACHINES—Metal
Atkins, E. C., & Co., Indianapolis, Ind.
Earle Gear & Mch. Co., Phila.
Espen-Lucas Mach. Works, Phila.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mch. Co., 1755 State St., Racine, Wis.
Tannewitz Wks., The, Grand Rapids, Mich.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., Indianapolis, Ind.
Simonds Saw & Steel Co., Fitchburg, Mass.
Tannewitz Wks., The, Grand Rapids, Mich.

SAWS—Circular, Rip and Cutoff
Atkins, E. C., & Co., Indianapolis, Ind.

SAWS—Cold Metal
Atkins, E. C., & Co., Indianapolis, Ind.
Hagen, H. J., 109 Lafayette St., N. Y. C.
Hunter Saw & Mch. Co., 5660 Butler St., Pitgh.

SAWS—Friction
Atkins, E. C., & Co., Indianapolis, Ind.
Ingersoll, Jos. T., & Son, Inc., Chicago.

SAWS—Hack Saw Blades
Atkins, E. C., & Co., Indianapolis, Ind.
Darwin & Milner, Inc., Cleveland.
Peerless Mch. Co., Racine, Wis.

SAWS—Hot Metal
Atkins, E. C., & Co., Indianapolis, Ind.
Hunter Saw & Mch. Co., 5660 Butler St., Pitgh.

SAWS—Inserted Tooth, Cold
Hagen, H. J., 109 Lafayette St., N. Y. C.
Hunter Saw & Mch. Co., 5660 Butler St., Pittsburgh.
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS—Screw Slotting
Atkins, E. C., & Co., Indianapolis, Ind.

SAWS—Sliding Frame
United Engrg. & Fdry. Co., Pitgh.

SCALES
Buffalo (N. Y.) Scale Co., 1202 Niagara St.
Exact Weight Scale Co., Columbus, Ohio.

SCRAP—Iron and Steel
Perry, Buxton, Doane Co., Boston.
Potts, Henry, & Co., Phila.

SCREENS—Perforated Metal
Chicago Perforating Co., Chicago, Ill.
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chi.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, Jersey City, N. J.

SCREENS—Vibrating
Link-Belt Co., Chicago.

SCREENS—Woven Wire
Ludlow-Saylor Wire Co., 600-610 S. Newstead Ave., St. Louis, Mo.
Manganese Steel Forge Co., Phila.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Bristol, Ct.
Bell, David, Co., Inc., The, Buffalo, N. Y.
Brown Bag Filling Mch. Co., Fitchburg, Mass.
Cleveland (O.) Cap Screw Co., The
Commonwealth Brass Corp., Detroit, Mich.
Corbin Screw Corp., New Britain, Ct.
Eastern Mch. Screw Corp., New Haven, Ct.
Ferry Cap & Set Screw Co., Cleveland.
Hartford (Ct.) Machine Screw Co.
Luers Bros. Mchry. & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland.
New Britain-Gridley Mch. Co., The, New Britain, Ct.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Penn Screw & Machine Works, Phila.
Progressive Mfg. Co., Torrington, Ct.
Screw Mch. Products Corp., Prov., R. I.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Western Screw Products Co., St. Louis, Mo.
White Sewing Mch. Corp., Cleveland.

SCREW MACHINERY—Automatic
Cleveland (O.) Automatic Mch. Co., The.
Cone Automatic Mach. Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.
New Britain-Gridley Mch. Co., The, New Britain, Ct.

SCREW MACHINERY—Automatic Wood
Cook, Asa S., Co., Hartford, Ct.

SCREW MACHINERY—Hand
Jones & Lamson Mch. Co., Springfield, Vt.

SCREW MACHINERY—Multiple Spindle
Cleveland (O.) Automatic Mch. Co., The.
Cone Automatic Mach. Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW MACHINERY—Semi-Automatic
Cleveland (O.) Automatic Mch. Co., The.

SCREWS—CAP
Clark Bros. Bolt Co., Milldale, Conn.
Cleveland (O.) Cap Screw Co.
Corbin Screw Corp., New Britain, Ct.
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Reed & Prince Mfg. Co., Worcester, Mass.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Western Screw Products Co., St. Louis, Mo.

SCREWS—Coach or Lag
Lamson & Sessions Co., The, Cleveland, O.

SCREWS—Cold Headed
Cleveland (O.) Cap Screw Co., The.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.

SCREWS—Machine
Corbin Screw Corp., New Britain, Ct.
Progressive Mfg. Co., Torrington, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.

SCREWS—Safety Set
Allen Mfg. Co., The, Hartford, Ct.
Bristol Co., Waterbury, Ct.
Progressive Mfg. Co., Torrington, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., Cleve.

SCREWS—Set
Ferry Cap & Set Screw Co., Cleveland.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Reed & Prince Mfg. Co., Worcester, Mass.
Strong, Carlisle & Hammond Co., Cleve.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.

SCREWS, Socket, Head, Cap.
Allen Mfg. Co., The, Hartford, Ct.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., The, Cleveland.

SCREWS—Thumb Malleable
Philadelphia (Pa.) Hardware & Malleable Iron Wks., Inc.

SCREWS—Wood
Corbin Screw Corp., New Britain, Ct.
Reed & Prince Mfg. Co., Worcester, Mass.

SCRUBBING MACHINES—Sheet
Wean Engng. Co., Inc., The, Warren, Ohio.

SCYTHE STONES & WHETSTONES
Carborundum Co., The, Niagara Falls, N.Y.

SECOND-HAND MACHINERY — See Clearing House Section
Adams, Ogden R., Rochester, N. Y.
Arnel, James P., Pitgh.
Bath, Cyrill J., & Co., Cleveland.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Briggs & Turivas, Zanesville, Ohio.
Brotherhood, Perry M., & Son, 25 Church St., N. Y. C.
Emerman, Louis E., & Co., Chicago.
Essley, E. L., Mchry. Co., Chicago.
Hamilton, J. R., Jersey City, N. J.
Herbert, Alfred, Ltd., Detroit, Mich.
Highway Truck Parts Co., Indianapolis, Ind.
Ideal Machinery Co., Plainville, Ct.
Johnson, Wm. C., & Sons, Mchry. Co., St. Louis, Mo.
Llewelyn, Thomas J., & Co., Pitgh.
Lodge & Shipley Mch. Tool Co., Cincl.
Lucas, J. L., & Son, Inc., Bridgeport, Conn.
Lunney, F. J., Amesbury, Mass.
MacCabe, T. B., Phila.
Marr-Galbreath Mchry. Co., Pitgh.
Midland Steel & Equip. Co., Chicago.
Miles Mchry. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., 410 Broome St., N. Y. C.
Nilson, A. H., Mach. Co., Bridgeport, Ct.
O'Brien Machry. Co., Phila.
Osborne & Sexton Mchry. Co., Columbus, O.
Ovigit, D. C., & Co., Cleveland.
Price, Harry D., Renfrew, Pa.
Prussian M. Mchry Co., Detroit.
Reliance Mchry. Sales Co., Pitgh.
Ross Power Equip. Co., Indianapolis.
Russell Mch. Co., Pitgh.
Simmons Mach. Tool Corp., Albany, N. Y.
Sun Mchry. Co., Inc., Newark, N. J.
Walsh, J. T., Buffalo, N. Y.
White, A. D. Machry. Co., Chicago.

SEPARATORS—Magnetic
Dings Magnetic Separator Co., Milwaukee.
Magnetic Mfg. Co., 626 South 28th St., Milwaukee.
Ohio Electric Mfg. Co., Cleveland.

SHAFTING—Cold Drawn
Cumberland (Md.) Steel Co.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.

SHAFTING—Smooth Forged or Rough Turned
Erie (Pa.) Forge Co.

SHAFTING—Steel
Bethlehem (Pa.) Steel Co.
Bliss & Laughlin, Inc., Harvey, Ill.
Cumberland (Md.) Steel Co

SHAFTING—Turned and Polished
Cumberland (Md.) Steel Co.
Jones & Laughlin Steel Corp., Pitgh.
Moltrup Steel Prods. Co., Beaver Falls, Pa.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.

SHAFTS—Flanged, Upset Forged
American Forge Co., 2621 S. Hoyne Ave., Chicago.

SHAPES—Cold Drawn
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.

SHAPES—Cold Rolled
Britesun, Inc., Chicago.

SHAPES—Steel
Phoenix Iron Co., Phila.

SHAPES—Wire
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Roebling's, John A., Sons Co., Trenton, N. J.
Titchener, E. H., & Co., Binghamton, N. Y.

SHAPING MACHINES—Horizontal
American Tool Works Co., Cincl.
Cincinnati (O.) Shaper Co., The.
Gould & Eberhardt, Newark, N. J.
Jacger, F. W., 140 Liberty St., N. Y. C.
Smith & Mills Co., Cincl.

SHAPING MACHINES—Vertical
Pratt & Whitney Co., Hartford, Conn.

SHEAR BLADES AND KNIVES
Atkins, E. C., & Co., Indianapolis, Ind.
Heppenstall Co., Pittsburgh.
Marshalltown (Iowa) Mfg. Co.
Pittsburgh Forgings Co., Coraopolis, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Alligator
Doelger & Kirsten, 3105 Chambers St., Mil.
Hendley & Whittemore Co., Beloit, Wis.
Long & Allstatter Co., Hamilton, Ohio.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engrg. & Fdry. Co., Pitgh.

SHEARING MACHINES—Angle, Hand and Power
Cleveland (O.) Punch & Shear Wks. Co.
Federal Bearings Co., Inc., Poughkeepsie, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach., Co., Pitgh., Pa.

SHEARING MACHINES — Automatic Alligator
Doelger & Kirsten, 3105 Chambers St., Mil.

SHEARING MACHINES—Bar
Aetna-Standard Eng. Co., Youngstown, O.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Long & Allstatter Co., Hamilton, Ohio.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Ft. of 51st St., Brooklyn, N. Y.

SHEARING MACHINES — Beam and Channel
Buffalo (N. Y.) Forge Co., 492 B'way.
Cleveland (O.) Punch & Shear Wks. Co.
Pels, Henry, & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.

SHEARING MACHINES—Billet
Buffalo (N. Y.) Forge Co., 492 B'way.
Morgan Engineering Co., Alliance, O.
Pels, Henry & Co., 90 West St., N. Y. C.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
United Engrg. & Fdry. Co., Pitgh.

SHEARING MACHINES — Continuous Automatic
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United Engrg. & Fdry. Co., Pitgh.

SHEARING MACHINES — Metal Slitting

Buffalo (N. Y.) Forge Co., 492 B'way.
Hendley & Whittemore Co., Beloit, Wis.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Torrington (Conn.) Mfg. Co.
United Mch. Tool Corp., 75 West St., New York City.

SHEARING MACHINES — Metal Slitting Gang

Adriance Mach. Works, Inc., 82 Richards St., Bklyn, N. Y.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Plate

Bertsch & Co., Cambridge City, Ind.
Cleveland (O.) Punch & Shear Wks. Co.
Dreis & Krump Mfg. Co., Chicago.
Long & Allstatter Co., Hamilton, Ohio.
Marshalltown (Iowa) Mfg. Co.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., Alliance, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Pels, Henry, & Co., 90 West St., N. Y. C.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Smith, David H., & Sons, Inc., Foot of 51st St., B'klyn, N. Y.
Thomas Spacing Mach. Co., Pitgh., Pa.
United Mch. Tool Corp., 75 West St., New York City.
United Engrg. & Fdry. Co., Pitgh.
Wood, R. D., & Co., Philadelphia.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Plate, Beveling & Scarfing

United Mch. Tool Corp., 75 West St., New York City.

SHEARING MACHINES—Rotary for Irregular Cutting

Newbold, R. S., & Son Co., Norristown, Pa.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Torrington (Conn.) Mfg. Co.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Rotary Slitting Gang

Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, Cleveland.

SHEARING MACHINES — Sheet and Plate

Dreis & Krump Mfg. Co., Chicago.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner), St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.
United Mch. Tool Corp., 75 West St., New York City.
Yoder Co., The, Cleveland.

SHEARING MACHINES—Squaring

Dreis & Krump Mfg. Co., Chicago.
Streine Tool & Mfg. Co., New Bremen, O.
Toledo (O.) Mch. & Tool Co.

SHEET BARS

Andrews Steel Co., Newport, Ky.

SHEET METAL MACHINERY

Adriance Machine Wks., Inc., 82 Richards St., Bklyn, N. Y.
Bliss, E. W. Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Cincinnati (O.) Shaper Co., The.
Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Dreis & Krump Mfg. Co., Chicago.
Excelsior Tool & Mch. Co., E. St. Louis, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Kane & Roach, Syracuse, N. Y.
Loy & Nawrath Div. Farrel-Birmingham Co., Inc., Derby, Conn.
Newbold, R. S., & Son Co., Norristown, Pa.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ohl, George A., & Co., Inc., Newark, N. J.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Streine Tool & Mfg. Co., New Bremen, O.
Standard Machinery Co., Auburn, R. I.
Toledo (O.) Machine & Tool Co.
V & O Press Co., Hudson, N. Y.
Yoder Co., The, Cleveland.

SHEET METAL WORK

Champion Sheet Metal Co., Inc., Cortland, N. Y.
Kelker Blower Co., Inc., Buffalo, N. Y.
St. Paul (Minn.) Corrugating Co.

SHEETS—Aluminum

Erdle Perforating Co., Rochester, N. Y.

SHEETS—Auto Body

American Rolling Mill Co., Middletown, O.
Eastern Rolling Mill Co., Balto., Md.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio
Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

SHEETS—Black

American Rolling Mill Co., Middletown, O.
Beals, McCarthy & Rogers, Inc., Buffalo.
Bethlehem (Pa.) Steel Company.
Inland Steel Co., Chicago.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sharon (Pa.) Steel Hoop Co.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed

Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Central Iron & Steel Co., Harrisburg, Pa.
Inland Steel Co., Chicago.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Sharon (Pa.) Steel Hoop Co.
Weirton (W. Va.) Steel Co.

SHEETS—Box Annealed

Newport (Ky.) Rolling Mill Co.

SHEETS—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze

Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

SHEETS—Copper Steel

Inland Steel Co., Chicago, Ill.
Newport (Ky.) Rolling Mill Co.

SHEETS—Electrical

Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middletown, O.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.

SHEETS—Enameling Stock

National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.

SHEETS — Enameling Stock (Genuine Open Hearth Iron)

American Rolling Mill Co., Middletown, O.
Newport (Ky.) Rolling Mill Co.

SHEETS—For Drawing and Stamping

Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middletown, O.
Eastern Rolling Mill Co., Balto., Md.
Firth-Sterling Steel Co., McKeesport, Pa.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Sharon (Pa.) Steel Hoop Co.
Weirton (W. Va.) Steel Co.

SHEETS—Full Finished

American Rolling Mill Co., Middletown, O.
Eastern Rolling Mill Co., Balto., Md.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Seneca Iron & Steel Co., Buffalo, N. Y.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co.

SHEETS—Galvanized, Flat and Corrugated

American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Co.
Inland Steel Co., Chicago.
National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

SHEETS—Locomotive Jacket

Newport (Ky.) Rolling Mill Co.

SHEETS—Long Terne

Weirton (W. Va.) Steel Co.

SHEETS—Metal Furniture

Allegheny Steel Co., Brackenridge, Pa.
Eastern Rolling Mill Co., Balto., Md.
Newport (Ky.) Rolling Mill Co.
Republic Steel Corp., Youngstown, Ohio.
Seneca Iron & Steel Co., Buffalo, N. Y.

SHEETS—Pickled

Newport (Ky.) Rolling Mill Co.
Weirton (W. Va.) Steel Co.

SHEETS—Polished

American Rolling Mill Co., Middletown, O.

SHEETS—Tin Mill Black

Weirton (W. Va.) Steel Co.

SHELLS—Brass and Copper

Bridgeport (Conn.) Brass Co.

SHELVING—Steel

Cleveland (O.) Wire Spring Co.

SHINGLES—Metal

Newport (Ky.) Rolling Mill Co.

SHOES—Horse & Mule

Burden Iron Co., Troy, N. Y.

SHOP FURNITURE

New Britain-Gridley Mch. Co., The, New Britain, Ct.

SHUTTERS—Steel & Wood Bi-Folding

Kinnear Mfg. Co., 817-67 Field Ave., Columbus, Ohio.

SILICON METAL

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKIDS—Lift Truck

Lewis-Shepard Co., 122 Walnut St., Watertown Station, Boston.

SLABS

Andrews Steel Co., Newport, Ky.
Central Iron & Steel Co., Harrisburg, Pa.

SLINGS—Wire Rope

American Cable Co., Inc., 100 E. 45th St., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.

SLOTTING MACHINES

Consolidated Mch. Tool Corp. of America, Rochester, N. Y.
Nacel Engrg. & Mch. Wks., Phila.

SPACING TABLES—Punching & Shearing

Thomas Spacing Mach. Co., Pitgh., Pa.

SPECIAL MACHINERY

Ams, Max, Mch. Co., The, Bridgeport, Conn.
Bethlehem (Pa.) Steel Co.
Budd-Ranney Eng. Co., The, Columbus, O.
Bullard Co., The, Bridgeport, Ct.
Cleveland (O.) Automatic Mch. Co., The
Cook, Asa S., Co., Hartford, Ct.
Cowdrey Mch. Wks., 39 Summer St., Fitchburg, Mass.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Electric Boat Co., Groton, Conn.
Hartford (Ct.) Special Mchry. Co.
Lambert & Todd Mch. Co., Camden, N. J.
Littell, F. J., Mch. Co., Chicago.
Manville, E. J., Mach. Co., Waterbury, Ct.
Morgan Engineering Co., Alliance, O.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Southwark Fdry & Mch. Co., Phila.
Sutton Engng. Co., Pittsburgh.
Torrington (Conn.) Mfg. Co.
Treadwell Engineering Co., Easton, Pa.
Yoder Co., The, Cleveland.

SPEED REDUCERS

Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Foote Bros. Gear & Mch. Co., Dept. 33, 111 N. Canal St., Chicago.
Jones, W. A., Fdry. & Mch. Co., 4434 W. Roosevelt Road, Chicago.
Link-Belt Co., Chicago.
Philadelphia (Pa.) Gear Works.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

SPIKES

American Steel & Wire Co., Chicago.
Ames, W., & Co., Jersey City, N. J.
Bethlehem (Pa.) Steel Co.
Inland Steel Co., Chicago.

SPRING MAKING MACHINERY

Baird Machine Co., Bridgeport, Ct.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS—Car

Amer. Spiral Spring & Mfg. Co., Pitgh.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn, N. Y.

SPRINGS—Wire, Coil or Flat

American Steel & Wire Co., Chicago.
Amer. Spring & Mfg. Corp., Holley, Mich.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Ct.
Cleveland (O.) Wire Spring Co.
Cook Spring Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Cuyahoga Spring Co., Cleve.
Dunbar Bros. Co., Bristol, Ct.
Fischer, Chas., Spring Co., 242 Kent Ave., Bklyn, N. Y.
Gibson, Wm. D., Co., Chicago.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lee Spring Co., Inc., 30 Main St., Bklyn., N. Y.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn, N. Y.
Raymond Mfg. Co., Corry, Pa.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Washburn Wire Co., Phillipsdale, R. I.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

SPROCKETS

Boston Gear Works Sales Co., Norfolk Downs, Mass.
Dundore Mfg. Co., Reading, Pa.
Link-Belt Co., Chicago.
Whitney Mfg. Co., Hartford, Ct.

SPROCKETS—Friction Clutch

Johnson, Carlyle, Mch. Co., Manchester, Conn.

STACKS—Steel

Chicago (Ill.) Bridge & Iron Wks.
Meehan Boiler & Construction Co., Lowellville, Ohio.

STAMPINGS OR DRAWINGS—Metal

Acme Stng. & Mfg. Co., Pittsburgh.
Akron-Selle Co., Akron, Ohio.
Amer. Spring & Mfg. Corp., Holley, Mich.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Barnes-Gibson-Raymond, Inc., Detroit.
Barnes, Wallace, Co., The, Bristol, Ct.
Behringer, E., Sheet Metal Wks., Inc., Newark, N. J.
Bossert Corp., The, Utica, N. Y.
Breese Bros. Co., Cincinnati.
Bridgeport (Conn.) Brass Co.
Burgess-Norton Mfg. Co., Geneva, Ill.
Champion Sheet Metal Co., Inc., Cortland, N. Y.
Cleveland (O.) Hardware Co.
Cook, H. C., Co., Ansonia, Ct.
Cook Spring Div. of Barnes-Gibson-Raymond, Inc., Ann Arbor, Mich.
Crosby Company, The, Buffalo, N. Y.
Cuyahoga Spring Co., Cleveland.
Davis Brake Beam Co., Johnstown, Pa.
Detroit (Mich.) Metal Specialty Corp.
Detroit (Mich.) Stamping Co.
Douglas & Lomason Co., Detroit.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Erdle Perforating Co., Rochester, N. Y.
Fischer, Chas., Spring Co., 242 Kent Ave., Brooklyn, N. Y.
General Mach. & Mfg. Co., Bridgeport, Ct.
Globe Mach. & Stpg. Co., Cleve.
Great Lakes Pressed Steel Corp., Buffalo, N. Y.
Hager, C., & Sons Hinge Mfg. Co., St. Louis, Mo.
Hassall, John, Inc., Clay & Oakland Sts., Brooklyn, N. Y.
Hill, N. N., Brass Co., The, East Hampton, Conn.
Hubbard, M. D., Spring Co., Pontiac, Mich.
Huebel Mfg. Co., Inc., Newark, N. J.
Hunter Pressed Steel Co., Lansdale, Pa.
Konigslow, E., Stpg. & Tool Co., The, Cleveland, Ohio.
Konigslow, Otto, Mfg. Co., Cleve.
Lansing (Mich.) Stpg. Co.
Lee Spring Co., Inc., 30 Main St., B'klyn., N. Y.
Master Products Co., The, 6420 Park Ave., S. E., Cleveland, O.
Metal Specialty Co., 1533 W. Sixth St., Cincinnati.
Miller & Van Winkle, Inc., 18 Bridge St., Bklyn., N. Y.
Mullins Mfg. Corp., Salem, Ohio.
New England Pressed Steel Co., 1 Washington Ave., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
Patent Specialty Supply Co., Inc., Cambridge, N. Y.
Penn Jersey Metal Products Corp., Camden, N. J.
Pennsylvania Car Co., Kansas City, Kans.
Pressed & Welded Steel Prods. Co., Long Island City, N. Y.
Sessions, J. H., & Son, Bristol, Ct.
Seymour (Ct.) Products Co., The.
Smith, Thomas, Co., 286 Grove St., Worcester, Mass.
Stanley Works, The, New Britain, Ct.
Torrington (Ct.) Co.
Truscon Steel Co., Pressed Steel Div., Cleveland.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Veeder Road, Inc., Hartford, Ct.
Welker Hoops Mfg. Co., Middletown, Conn.
White Sewing Mch. Corp., Cleveland.
Worcester (Mass.) Pressed Steel Co.
Worcester (Mass.) Stamped Metal Co.
Youngstown Steel Car Corp., Niles, Ohio.

STAMPS—Steel Alphabets and Figures

Noble & Westbrook Mfg. Co., Hartford, Ct.
Schwerdtle Stamp Co., Bridgeport, Ct.

STAPLES—Wire

American Steel & Wire Co., Chicago.
Titchener, E. H., & Co., Binghamton, N. Y.

STEEL—Alloy

Alan Wood Steel Co. Conshohocken, Pa.
Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Andrews Steel Co., The, Newport, Ky.
Associated Alloy Steel Co., Inc., Cleveland.
Bethlehem (Pa.) Steel Co.
Colonial Steel Co., Pittsburgh.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Heppenstall Co., Pittsburgh.
Latrobe (Pa.) Electric Steel Co.
Prosser, Thomas & Son, Wellman Dept., 15 Gold St., New York City.
Republic Steel Corp., Youngstown, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Timken Steel & Tube Co., Canton, Ohio.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Alloy, Cold Drawn

Moltrup Steel Prods. Co., Beaver Falls, Pa.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.

STEEL—Bright Finished

Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.

STEEL—Carbon

Andrews Steel Co., The, Newport, Ky.
Carnegie Steel Co., Pittsburgh.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Prosser, Thomas & Son, Wellman Dept., 15 Gold St., New York City.

STEEL—Carbon Vanadium

Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.

STEEL—Chrome

Allegheny Steel Co., Brackenridge, Pa.
Andrews Steel Co., The, Newport, Ky.
Associated Alloy Steel Co., Inc., Cleveland.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.

STEEL—Chrome Manganese

Latrobe (Pa.) Electric Steel Co.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Chrome Nickel

Allegheny Steel Co., Brackenridge, Pa.
Associated Alloy Steel Co., Inc., Cleveland.
Andrews Steel Co., Newport, Ky.
Krupp Nirosta Co., Inc., New York Central Bldg., New York City.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.

STEEL—Chrome Vanadium

Andrews Steel Co., Newport, Ky.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.

STEEL—Cobalt

Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn

American Steel & Wire Co., Chicago.
Bethlehem (Pa.) Steel Co.
Bliss & Laughlin, Inc., Harvey, Ill.

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Products Index

Firth-Sterling Steel Co., McKeesport, Pa.
Globe Wire Company, Div. of the Firth-Sterling Steel Co., Sharpsburg, Pa.
Latrobe (Pa.) Electric Steel Co.
Maltrup Steel Prods. Co., Beaver Falls, Pa.
Rathbone, A. B. & J., Palmer, Mass.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Cold Rolled Strips

Acme Steel Co., Chicago.
American Steel & Wire Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Athenia Steel Co., 135 William St., N. Y.
Beals, McCarthy & Rogers, Inc., Buffalo.
Cold Metal Process Co., Youngstown, Ohio.
Griffin Mfg. Co., Erie, Pa.
Latrobe (Pa.) Electric Steel Co.
Ryerson, Jos. T. & Son, Inc., Chicago.
Stanley Works, The, New Britain, Ct.
Superior Steel Corp., Grant Bldg., Ptgh.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Washburn Wire Co., Inc., Phillipsdale, R. I.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Ptgh.
Wetherell Bros. Co., Cambridge, 39, Mass.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City.
Worcester (Mass.) Pressed Steel Co.

STEEL—Crucible

Colonial Steel Co., Pittsburgh.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery

Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Die

Andrews Steel Co., The, Newport, Ky
Bethlehem (Pa.) Steel Company.
Firth-Sterling Steel Co., McKeesport, Pa.
Heppenstall Co., Pittsburgh.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.

STEEL—Drill

Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Electric

Bethlehem (Pa.) Steel Co.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.
Prosser, Thomas & Son, Widia Dept., 15 Gold St., New York City.
Timken Steel & Tube Co., Canton, Ohio.

STEEL—High Speed

Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Bethlehem (Pa.) Steel Co.
Colonial Steel Co., Pittsburgh.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Elec. Steel Co.
Simonds Saw & Steel Co., Lockport, N. Y.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Hot Rolled Strips

Acme Steel Co., Chicago.
American Tube & Stpg. Plant (The Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace Co., The, Bristol, Conn.
Griffin Mfg. Co., Erie, Pa.
Laclede Steel Co., St. Louis, Mo.
Latrobe (Pa.) Elec. Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Sharon (Pa.) Steel Hoop Co.
Stanley Works, The, New Britain, Ct.
Superior Steel Corp., Grant Bldg., Ptgh.
Weirton (W. Va.) Steel Co.
West Leechburg Steel Co., Ptgh.

STEEL—Magnet

Latrobe (Pa.) Elec. Steel Co.
Simonds Saw & Steel Co., Lockport, N. Y.

STEEL—Manganese Rolled or Forged

Manganese Steel Forge Co., Phila.

STEEL—Nickel

Andrews Steel Co., Newport, Ky.
Republic Steel Corp., Youngstown, Ohio.

STEEL—Open Hearth

Andrews Steel Co., The, Newport, Ky.
Jones & Laughlin Steel Corp., Ptgh.
Prosser, Thomas & Son, Widia Dept., 15 Gold St., New York City.
Sharon (Pa.) Steel Hoop Co.
Timken Steel & Tube Co., Canton, Ohio.

STEEL—Rustless

Allegheny Steel Co., Brackenridge, Pa.
Associated Alloy Steel Co., Inc., Cleveland.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe (Pa.) Electric Steel Co.

STEEL—Screw

Allegheny Steel Co., Brackenridge, Pa.
American Steel & Wire Co., Chicago.
Jones & Laughlin Steel Corp., Ptgh.
Timken Steel & Tube Co., Canton, Ohio.
Union Drawn Steel Co., Republic Bldg., Youngstown, Ohio.

STEEL—Special Analysis

Andrews Steel Co., The, Newport, Ky.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Timken Steel & Tube Co., Canton, Ohio.
West Leechburg Steel Co., Ptgh.

STEEL—Spring

Athenia Steel Co., 135 William St., N. Y.
Barnes, Wallace, Co., The, Bristol, Ct.
Bethlehem (Pa.) Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Timken Steel & Tube Co., Canton, Ohio.

STEEL—Stainless

Allegheny Steel Co., Brackenridge, Pa.
Associated Alloy Steel Co., Inc., Cleveland.
Bethlehem (Pa.) Steel Co.
Firth-Sterling Steel Co., McKeesport, Pa.
Krupp Nirosta Co., Inc., New York Central Bldg., New York City.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Youngstown, Ohio.
Simonds Saw & Steel Co., Lockport, N. Y.

STEEL—Tool

Allen, Edgar, Steel Co., Inc., 745 Washington St., N. Y. C.
Beals, McCarthy & Rogers, Inc., Buffalo.
Bethlehem (Pa.) Steel Co.
Colonial Steel Co., Pittsburgh.
Columbia Tool Steel Co., Chicago Hgts., Ill.
Darwin & Milner, Inc., Cleveland.
Firth-Sterling Steel Co., McKeesport, Pa.
Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.
Midvale Co., The, Nicetown, Phila., Pa.
Milne, A., & Co., 745 Washington St., N. Y. C.
Prosser, Thomas & Son, Widia Dept., 15 Gold St., New York City.
Ryerson, Jos. T. & Son, Inc., Chicago.
Simonds Saw & Steel Co., Lockport, N. Y.
Swedish-American Steel Corp., 427 Kent Ave., Brooklyn, N. Y.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wetherell Bros. Co., Cambridge 39, Mass.

STEEL—Tool, Special Shapes

Heller Bros. Co., Newark, N. J.
Latrobe (Pa.) Electric Steel Co.

STEEL—Vanadium

Andrews Steel Co., Newport, Ky.
Latrobe (Pa.) Elec. Steel Co.
Republic Steel Corp., Youngstown, Ohio.

STEEL PLANTS AND ROLLING MILLS

McKee, Arthur G., & Co., Cleve.
Perin & Marshall, 11 West 42nd St., N. Y. C.

STEEL PLATE CONSTRUCTION

Chicago (Ill.) Bridge & Iron Wks.
Cole, R. D., Mfg. Co., Newnan, Ga.
Graver Tank & Mfg. Corp., East Chicago, Ind.
Jones & Laughlin Steel Corp., Ptgh.
Lancaster (Pa.) Iron Works, Inc.
McClintic-Marshall Co., Pittsburgh.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Petroleum Iron Works Co., Sharon, Pa.
Traylor Engng. & Mfg. Co., Allentown, Pa.

STEEL ROLLS

Heppenstall Co., Pittsburgh.

STEPS—Ladder & Stair, Safety

Blaw-Knox Co., Pittsburgh.
Central Iron & Steel Co., Harrisburg, Pa.

STEPS—Safety

Hendrick Mfg. Co., Carbondale, Pa.

STOCKS AND DIES

Jones & Lamson Mach. Co., Springfield, Vt.
Saunders', D., Sons, Yonkers, N. Y.

STOKERS

Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

STOPPERS—Open-Hearth, Bessemer or Electric Furnace

McCullough-Dalzell Crucible Co., Ptgh.
Ross-Tacony Crucible Co., Phila.

STOVES—Hot Blast

Brassert, H. A., & Co., Chicago.
Freyn Engineering Co., Chicago.

STRAIGHTENING MACHINES

Aetna-Standard Eng. Co., Youngstown, O.
Bliss, E. W., Co., 53rd St. & 2nd Ave., Brooklyn, N. Y.
Kane & Roach, Syracuse, N. Y.
Newbold, R. S., & Son Co., Norristown, Pa.
Pels, Henry, & Co., 90 West St., N. Y. C.
Sutton Engng. Co., Pittsburgh.
Thomas Spacing Mch. Co., Ptgh., Pa.
Whitney Metal Tool Co., Rockford, Ill.

STRAIGHTENING MACHINES—Wire

Lewis Mch. Co., The, Cleveland, Ohio.
Shuster, F. B., Co., New Haven, Ct.

STRAIGHTENING & CUTTING MACHINES—Strip Automatic

Hallden Machine Co., Thomaston, Conn.

STRUCTURAL IRON AND STEEL WORK

American Bridge Co., 71 B'way., N. Y. C.
American Institute of Steel Construction, Inc., 200 Madison Ave., N. Y. C.
Austin Co., The, Cleveland.
Belmont Iron Wks., Phila.
Bethlehem (Pa.) Steel Co.
Morgan Engng. Co., Alliance, O.
Phoenix Iron Co., Phila.
Shoemaker Bridge Co., Pottstown, Pa.
Virginia Bridge & Iron Co., Roanoke, Va.
Wellman Engineering Co., Cleveland.

STRUCTURAL STEEL — See Angles, Beams, Channels and Tees

SULPHATE OF IRON

American Steel & Wire Co., Chicago.

SUPERHEATERS

Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

SWAGING MACHINES

Etna Machine Co., The, Toledo.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.
Standard Machinery Co., Auburn, R. I.
Torrington (Ct.) Co.

SWITCHES—Electric

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TACHOMETERS

Brown Instrument Co., Philadelphia.

TACHOMETERS—Angular and Linear Velocity

Barbour-Stockwell Co., Cambridge, Mass.

TACKS

American Steel & Wire Co., Chicago.

TANKS—Compressed Air, Gas, Oil and Water

Air-Tight Steel Tank Co., Ptgh.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Graver Tank & Mfg. Corp., East Chicago, Ind.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Petroleum Iron Works Co., Sharon, Pa.
Scaife, Wm. B., & Sons Co., Ptgh.

TANKS—Elevated Steel

Chicago (Ill.) Bridge & Iron Wks.
Cole, R. D., Mfg. Co., Newnan, Ga.
Graver Tank & Mfg. Corp., East Chicago, Ind.

TANKS—Elevated Wood

Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Gasoline & Oil

Chicago (Ill.) Bridge & Iron Wks.
Graver Tank & Mfg. Corp., East Chicago, Ind.

TANKS—Iron and Steel

Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Chicago (Ill.) Bridge & Iron Wks.
Graver Tank & Mfg. Corp., East Chicago, Ind.
Janney, Joseph A., Jr., Phila.
Kellogg, M. W., Co., The, 225 Bdway, N. Y. C.
Lancaster (Pa.) Iron Works, Inc.
McClintic-Marshall Co., Pittsburgh.
Scaife, Wm. B., & Sons Co., Ptgh.

TANKS—Lead Lined

Gross Lead Burning & Coating Corp., Cleveland.
Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Pickling

Hauser-Stander Tank Co., Cincinnati.
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Rubber Lined

Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Seamless Steel

Truscon Steel Co., Pressed Steel Div., Cleveland.

TANKS—Water

Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TANKS—Welded

Air-Tight Steel Tank Co., Ptgh.
Graver Tank & Mfg. Corp., East Chicago, Ind.
Scaife, Wm. B., & Sons Co., Ptgh.

TANKS—Wood

Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
Hauser-Stander Tank Co., Cincinnati.
Woolford, G., Wood Tank Mfg. Co., Phila.

TAPPING MACHINES

Baker Bros., Inc., Toledo.
Barnes Drill Co., Inc., Rockford, Ill.
Defiance (O.) Machine Works.
National Automatic Tool Co., Richmond, Ind.
Whitney Metal Tool Co., Rockford, Ill.

TAPPING MACHINES—Nuts

National Mchry. Co., Tiffin, Ohio.

TAPS—Collapsing

Geometric Tool Co., New Haven, Conn.
Landis Mach. Co., Inc., Waynesboro, Pa.
Murchey Mach. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.

TAPS AND DIES

Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Mch. & Tool Co., 951 Porter St., Detroit.
National Acme Co., The, Cleveland.
Pipe Mchry. Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn.

TEES—See Angles, Beams, Channels and Tees

TELEPHONES—Interior

Screw Machine Products Corp., Prov., R. I.

TEMPLATES—Adjustable

Woodworkers' Tool Wks., Inc., Chicago.

TERNE PLATES

National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.

TERNE PLATES—Copper Bearing

Weirton (W. Va.) Steel Co.

TESTING MACHINES—Materials

Southwark Fdry. & Mch. Co., Phila.

THERMOMETERS—Indicating

Brown Instrument Co., Philadelphia.

THERMOMETERS—Recording

Brown Instrument Co., Philadelphia.

THREAD CUTTING TOOLS—See Dies, Taps, Screw Plates, etc.

THREAD ROLLING MACHINES

Nilson, A. H., Mach. Co., Bridgeport, Ct.
Waterbury (Ct.) Farrel Fdry. & Mch. Co.

THREADING MACHINES

Geometric Tool Co., New Haven, Conn.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Mchry. Co., Tiffin, Ohio.

THREADING MACHINES—Automatic

Landis Mch. Co., Inc., Waynesboro, Pa.

TIE PLATES

Inland Steel Co., Chicago.
Joliet (Ill.) Wrought Washer Co.
Weirton (W. Va.) Steel Co.

TIES—Bale

American Steel & Wire Co., Chicago.

TIES—Creosoted

Century Wood Preserving Co., Ptgh.

TIES—Metal

Bethlehem (Pa.) Steel Co.

TIN PLATE

National Ass'n. of Flat Rolled Steel Mfrs., Cleveland.
Weirton (W. Va.) Steel Co.
Youngstown (O.) Sheet & Tube Co.

TIN PLATE MACHINERY

Aetna-Standard Eng. Co., Youngstown, O.
Wean Engng. Co., Inc., The, Warren, Ohio.

TINNERS' TOOLS AND MACHINES

Niagara Mch. & Tool Wks., Buffalo, N. Y.
Quickwork Co., The (Not Incorporated—H. Collier Smith, Owner) St. Marys, O.

TINNING EQUIPMENT—Sheets

Wean Engng. Co., Inc., The, Warren, Ohio.

TOOL BITS

Haynes Stellite Co., 30 East 42nd St., N. Y. C.
Prosser, Thomas & Son, Widia Dept., 15 Gold St., New York City.

TOOL HOLDERS

Armstrong Bros. Tool Co., Chicago.

TOOLS, JIGS, FIXTURES, Etc.

Pratt & Whitney Co., Hartford, Conn.

TOOLS—Lathe

Armstrong Bros. Tool Co., Chicago.
Prosser, Thomas & Son, Widia Dept., 15 Gold St., New York City.

TOOLS—Metal Cutting

Haynes Stellite Co., 30 East 42nd St., N. Y. C.
Prosser, Thomas & Son, Widia Dept., 15 Gold St., New York City.

TOOLS—Steam and Gas Fitters

Saunders', D., Sons, Yonkers, N. Y.

TOOLS—Tungsten Carbide

Firth-Sterling Steel Co., McKeesport, Pa.
Prosser, Thomas & Son, Widia Dept., 15 Gold St., New York City.

TORCHES—Blow

Anthony Co., L. I. C., N. Y.
Hauck Mfg. Co., 128 10th St., Bklyn, N.Y.

TOWERS—Steel

Blaw-Knox Co., Pittsburgh.
Caldwell, W. E., Co., 1940 Brook St., Louisville, Ky.
McClintic-Marshall Co., Pittsburgh.

TOWERS—Transmission

Blaw-Knox Co., Pittsburgh.
McClintic-Marshall Co., Pittsburgh.

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Bethlehem (Pa.) Steel Co.

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American MonoRail Co., The, Cleveland.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

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Allegheny Steel Co., Brackenridge, Pa.
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Keating, E. F., Co., 452 Water St., N. Y. C.
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Paper & Textile Mchry. Co., The, Sandusky, Ohio.

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Service Steel Co., Detroit.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.
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Michigan Steel Tube Prods. Co., Detroit

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Tyler Tube & Pipe Co., The, Washington, Pa.
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Freyn Engineering Co., Chicago.

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Morgan Construction Co., Worcester, Mass.
Swindell-Dressler Corp., Box 1753, Pgh.
Wellman Engineering Co., Cleveland.

VALVES—Gas, Water and Steam
Jarecki Mfg. Co., Erie, Pa.
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Kennedy Valve Mfg. Co., Elmira, N. Y.
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Birdsboro (Pa.) Steel Fdry. & Mch. Co.
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Central Iron & Steel Co., Harrisburg, Pa.
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Joliet (Ill.) Wrought Washer Co.
Master Products Co., The, 6420 Park Ave., S. E., Cleveland, O.
Nicetown Plate Washer Co., Inc., Phila.
Sessions, J. H., & Son, Bristol, Conn.
Smith, Thomas, Co., 286 Grove St. Worcester, Mass.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.
Wrought Washer Mfg. Co., Milwaukee.

WASHERS—Leather
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WASHERS—Lock
Lahbe Mfg. Co., Inc., The, Denver, Colo.
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WASHERS—Spring Steel
Dunbar Bros. Co., Bristol, Ct.

WASHERS—Tempered
Barnes, Wallace, Co., The, Bristol, Ct.
United Screw & Bolt Corp., Cleveland, Ohio, & Chicago, Ill.

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Detroit (Mich.) Sheet Metal Wks.
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WELDING—Electric
Agnew Elec. Welder Co., Milford, Mich.
Blaw-Knox Co., Pittsburgh
Federal Mch. & Welder Co., Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

WELDING—Forge & Hammer
Blaw-Knox Co., Pittsburgh

WELDING—Oxy-Acetylene
Blaw-Knox Co., Pittsburgh
Imperial Brass Mfg. Co., 1210 W. Harrison St., Chicago, Ill.
Weldit Acetylene Co., Detroit.

WELDING AND CUTTING MACHINES AND EQUIPMENT—Oxy-Acetylene
Air Reduction Sales Co., 60 East 42nd St., N. Y. C.
Imperial Brass Mfg. Co., 1210 W. Harrison St., Chicago, Ill.
Weldit Acetylene Co., Detroit.

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Federal Mch. & Welder Co., Warren, O.
Thomson-Gibb Electric Welding Co., 661 Pleasant St., Lynn, Mass.

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WHEELS—Caster and Truck
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Seneca Wire & Mfg. Co., Fostoria, Ohio.

WIRE—Barb
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Phosphor Bronze Smelting Co., Phila.
Seymour (Ct.) Mfg. Co.

WIRE—BROOM
American Steel & Wire Co., Chicago.

WIRE—Flat, Round, Square or Special Shapes
American Steel & Wire Co., Chicago.
Hartshorn, Stewart Co., 250 5th Ave., New York City.
Page Steel & Wire Co., Bridgeport, Ct.
Prentiss, Geo. W., & Co., Holyoke, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, Ohio.
Washburn Wire Co., Phillipsdale, R. I.
Washburn Wire Co., Inc., 118th St. & Harlem River, N. Y. C.
Webb Wire Works, New Brunswick, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

WIRE—Insulated
American Steel & Wire Co., Chicago.
Roebling's, John A., Sons Co., Trenton, N.J.

WIRE—Mattress
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Roebling's, John A., Sons Co., Trenton, N.J.

WIRE—Netting
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Ludlow-Saylor Wire Co., 609-610 S. Newstead Ave., St. Louis, Mo.
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Wickwire Brothers, Cortland, N. Y.

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Seneca Wire & Mfg. Co., Fostoria, Ohio.
Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

WIRE—Steel
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WIRE—Telephone & Telegraph
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American Steel & Wire Co., Chicago.

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Roebling's, John A., Sons Co., Trenton, N. J.
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Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

WIRE—Wire Cloth
Seneca Wire & Mfg. Co., Fostoria, Ohio.

WIRE CLOTH
Buffalo (N. Y.) Wire Works Co., Inc.
Ludlow-Saylor Wire Co., 609-610 S. Newstead Ave., St. Louis, Mo.
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WIRE COILING AND SPIRALLING MACHINERY
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WIRE DRAWING MACHINERY
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Wickwire Spencer Steel Co., 41 East 42nd St., New York City.

WIRE ROPE FITTINGS
American Cable Co., Inc., 100 E. 45th St., New York City.
American Steel & Wire Co., Chicago.
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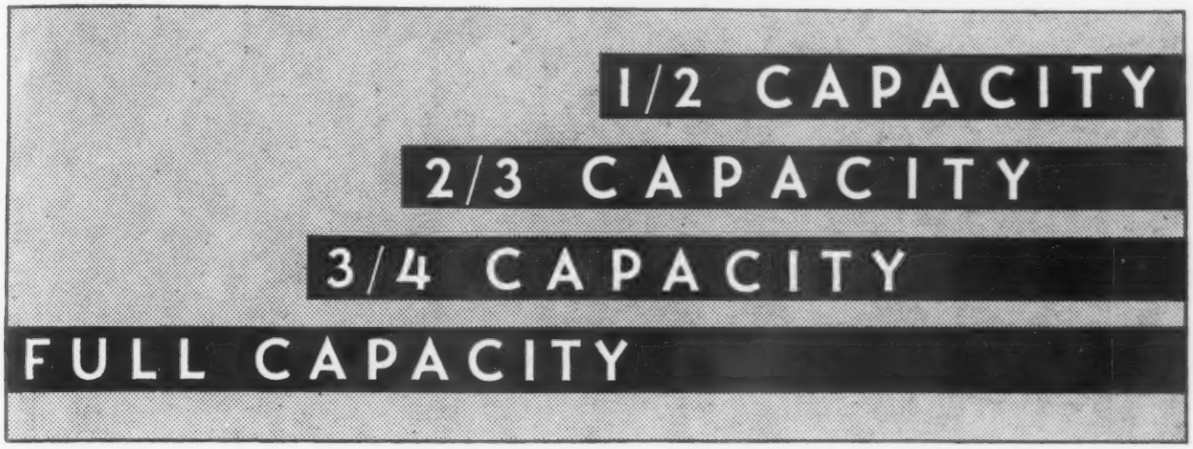
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Action — more drastic, more revolutionary — that will cut deeply into production costs is the only way out for many plants today. Radically changed or new products, entirely new processes, have increased the crop of White Elephants—plants incapable of profitable operation at fractional capacity.

A number of manufacturers recognizing the seriousness of the situation, have had the courage to take action. They have found profits in blueprints — applied sound engineering to their problems — found that it has paid for itself many times over.

In this process of readjustment, whether it involves the radical modernization of the old plant or the building of complete new facilities, Austin Engineers can bring you the most up-to-the-minute ideas on layout and design.

No miracle makers . . but engineers who are unusually progressive in developing ideas and pointing the way to profitable action. An interview granted, with permission to look over your facilities, will cost you nothing—may lead to unexpected decisions on your part . . . decisions which will have an all-important bearing on your profits for 1931 and for some years to come.

A new booklet, just off the press, "101 QUESTIONS THAT SHOULD BE ANSWERED BEFORE YOU BUILD," intended primarily to help those about to build, raises questions the answers to which are important to many manufacturers who have building operations farthest from their minds. A single idea from this booklet may mean much to you. *Why not be prepared to talk about something entirely out of the "corner cutting" category at your Annual Meeting?* Wire, phone or write—no obligation, of course.

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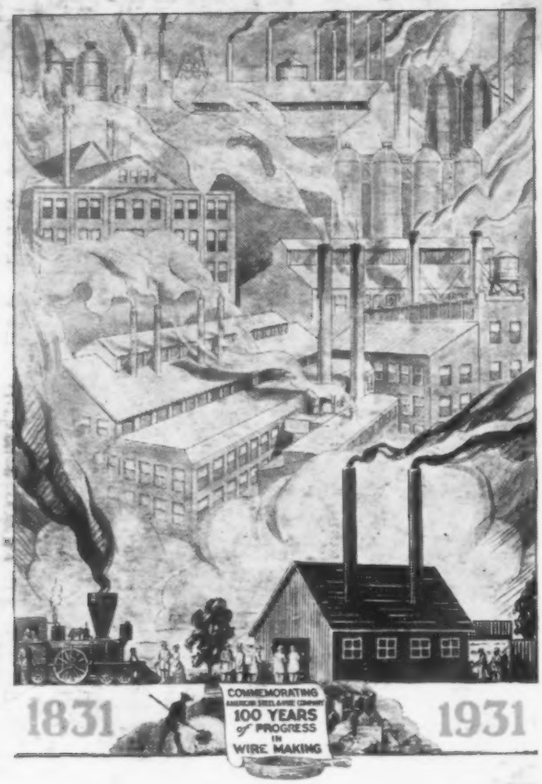
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Memo to The Austin Company, Cleveland ☐ Send copy of booklet "101 Questions That Should be Answered Before You Build"

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